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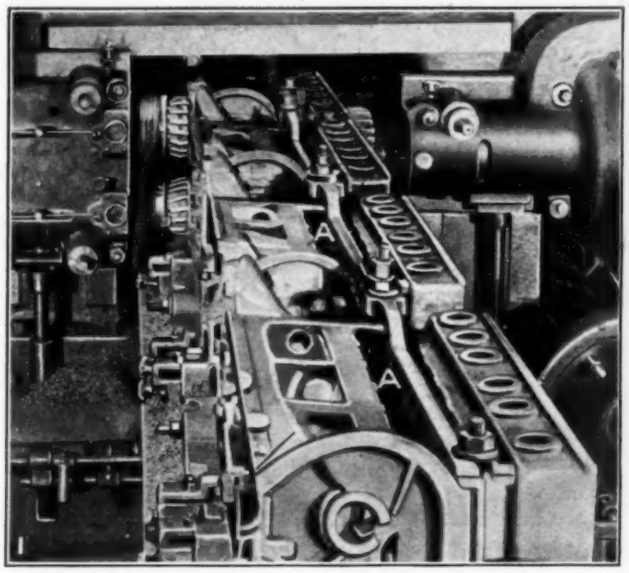
Cylinder Methods in the Reo Plant

Unusual Valve Combination Requires Special Tools — Combustion Chamber Counterbored to Secure Uniform Compression Space—Milling Machine with Chip Exhauster

By FRED H. COLVIN
Editor, American Machinist

THERE is much of interest in the plant of the Reo Motor Car Co., Lansing, Mich. It must be remembered that this is an old company which has had a steady growth; it has never been spectacular, either in car design or in phenomenal increase of plant, but there are few shops where one feels the same atmosphere of harmony and co-operation, where a real interest in the work is everywhere so apparent.



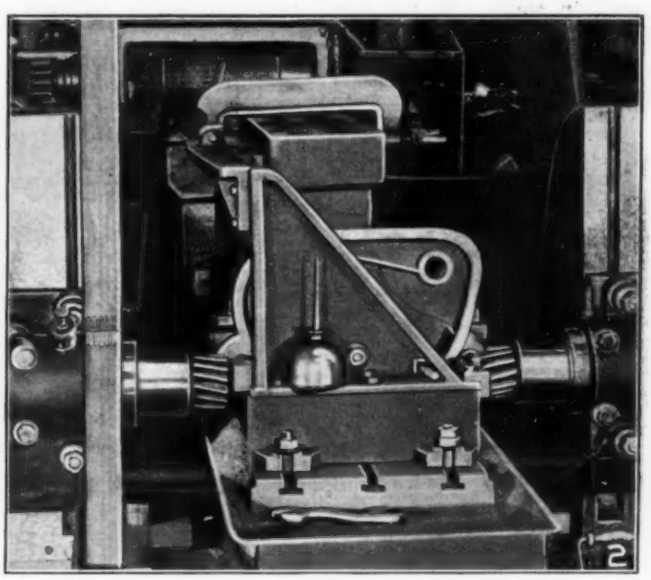


FIG. 1. MILLING TOP AND BOTTOM OF CYLINDERS. FIG. 2. MILLING ENDS OF SUPPORTING ARMS

The Reo six-cylinder motor has a valve combination which is unusual. The intake valve is in a removable head and the exhaust valve is in the L-head of the cylinder casting. This arrangement will be noted in connection with the work to be described. After the usual chipping, snagging and cleaning, the core holes are drilled, tapped and plugged. Then the cylinder block goes to the Ingersoll milling machine, shown in Fig. 1, where the two smaller cutters at the left mill the bottom face and the larger cutter at the right, mills the upper face to receive the removable head. The block is easily clamped by the bars *A*, being carefully lined up and supported by simple fixtures.

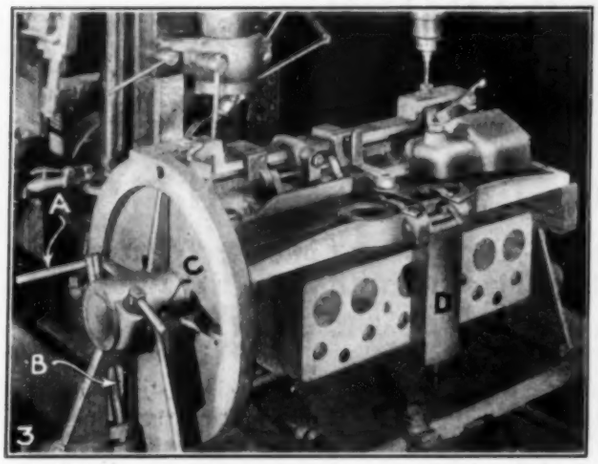
Working from the bottom face, the arms which support the motor in the chassis are then milled on the double head machine in Fig. 2. Great care is taken to have these arms milled in their proper relation to the cylinder block and this operation receives most careful attention.

The block then goes to the trunnion drilling-fixture, shown in Fig. 3, which has several interesting features. The locking pin is operated by the handle *A*, through the rod *B*, while the handle *C* clamps the fixture in any desired position for inspection or other purposes. One of the holes in the arm is being drilled and the two large water pipe holes near the top of the cylinder are also drilled at this setting. Numerous other holes are also drilled, including those for the magneto and water pump. When rolled over in the opposite position the block can be easily removed by releasing the swinging clamp *D*.

A simple but substantial milling head for straddle milling the four main bearings is shown in Fig. 4. The cutters are spaced by fixed collars but provision is made for end adjustment of the pairs of cutters should this be necessary. This view shows the arms milled for supporting the motor and the holes drilled for bolting in place.

Boring, Reaming and Grinding Cylinders

The cylinder barrels are next bored (Fig. 5) in two operations, roughing and finishing, and numerous drillings take place, including the holes for the main bearing studs. After assembling the main bearing caps the block is ready for the boring of the main bearings and the camshaft holes, as in Fig. 6. The boring bars are well supported in long bushings and the work is easily handled. The bearings are then line-reamed with both roughing and finishing reamers and the caps removed. Oil grooves are cut, tappet and push rod guide-holes



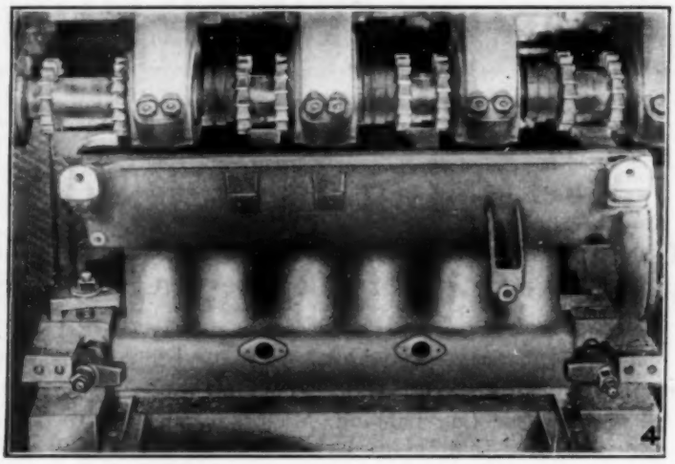
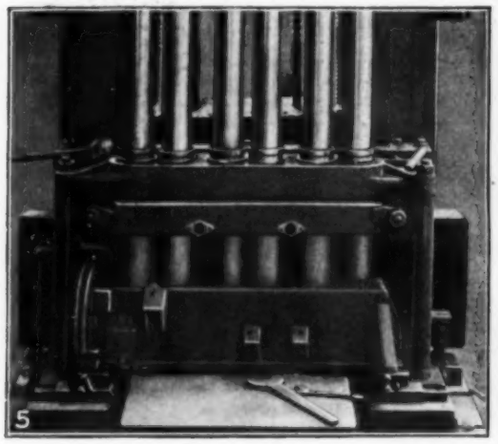


FIG. 3. ROLL-OVER FIXTURE FOR DRILL ARMS. FIG. 4. STRADDLE MILLING BEARINGS

are bored and reamed, after which the cylinder bore is carefully reamed with a single tool in a special machine as shown in Fig. 7.

It will be noted that the lower flange of the cylinder block rests on sliding ways so that the whole block can be readily moved from one bore to the next. These sliding ways extend to the next machine so that the cylinder blocks come in a steady stream and the operator does not have to lift or carry them.

A special fixture for water testing is shown in Fig. 8. Here the top plate is held by ten swinging bolts and the two sides of the fixture are tied together by the bars and pins *A* and *B*. The handwheels and thumbscrews hold covers over the openings while the water is



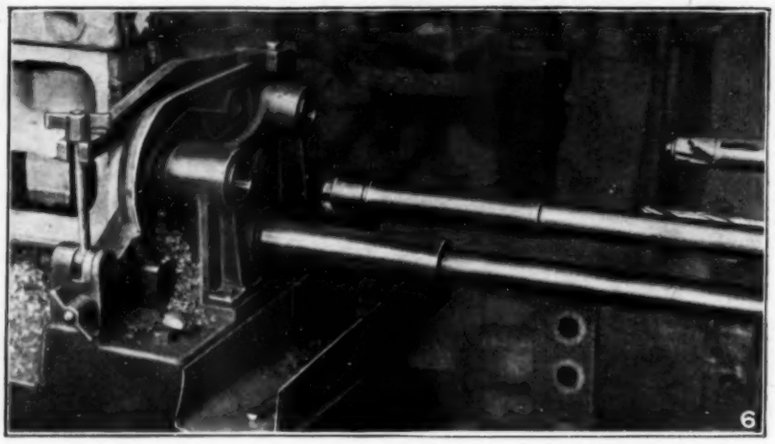
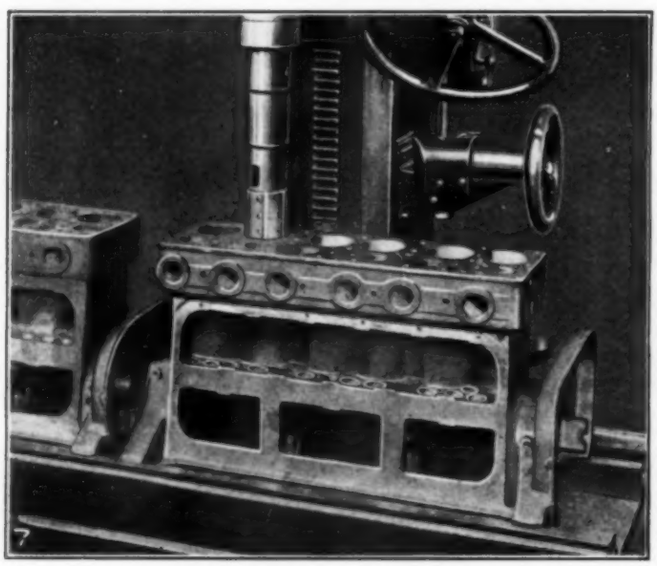


FIG. 5. BORING THE CYLINDERS. FIG. 6. BORING CRANKSHAFT AND CAMSHAFT BEARINGS



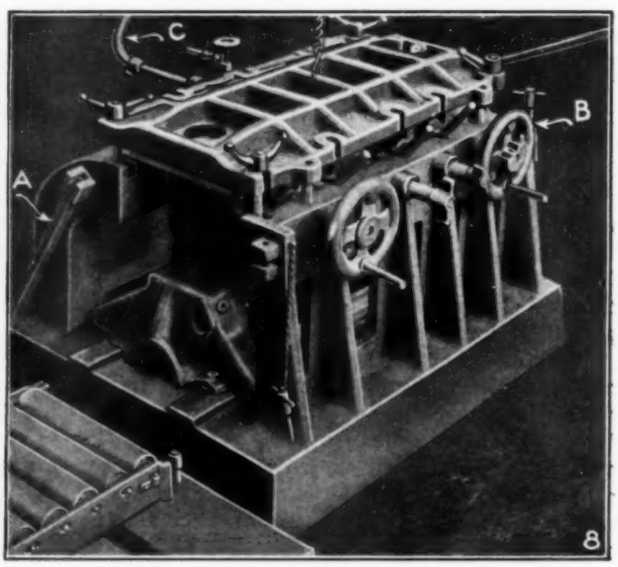
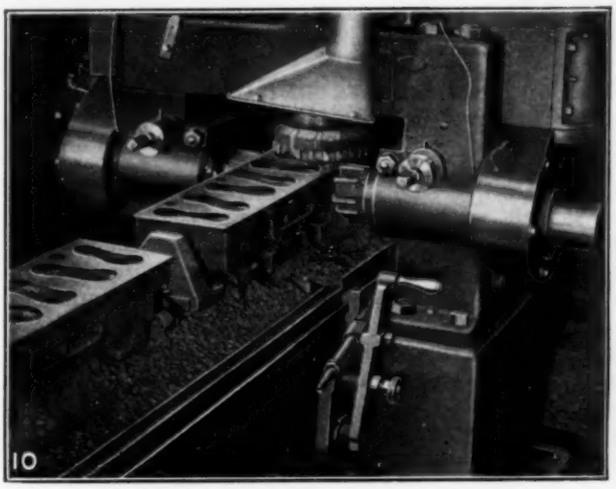


FIG. 7. FINAL REAMING BEFORE GRINDING. FIG. 8. THE WATER TESTING FIXTURE



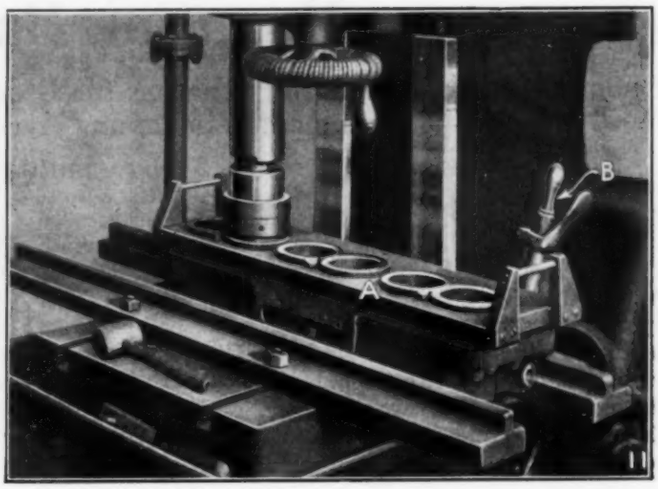


FIG. 10. MILLING THE CYLINDER HEADS. FIG. 11. COUNTERBORING THE COMBUSTION CHAMBER

admitted by hose *C*. Oil pipe holes and pockets are carefully cleaned out, main bearings put in place and finish line-reamed, valve seats are reamed and ground, camshaft bearings are hand reamed and the cylinders are ready for assembly.

A convenient assembling stand is used, as shown in Fig. 9. It is not unusual except that the rings have fittings which match the arms in the cylinder block and represent the frame in the final assembly. The rotating rings can be clamped in any desired position by the handle *A*. The large casters make it easy to roll the motor to the next point in the assembly line.

The Cylinder Head

The cylinder head, which carries the intake valve, is somewhat different from a head which simply covers the top of the cylinders, and requires different handling. The first machining operation is to grind the top after which the bottom and both sides are milled, as in Fig. 10, on a small special Ingersoll machine provided with an exhaust system for keeping the work clear of chips.

After numerous drilling operations, hollow-milling for valve spring clearance and finish-milling the bottom to insure a tight joint, the combustion chamber is counterbored to secure uniform compression space. This is shown in Fig. 11. The guide plate *A* and the cylinder head are indexed by the lever *B* in each of the six positions. The plate is easily handled by the attachments at the ends.

Water testing the head and finishing the valve seats is then done and finally the head goes to the assembly department.

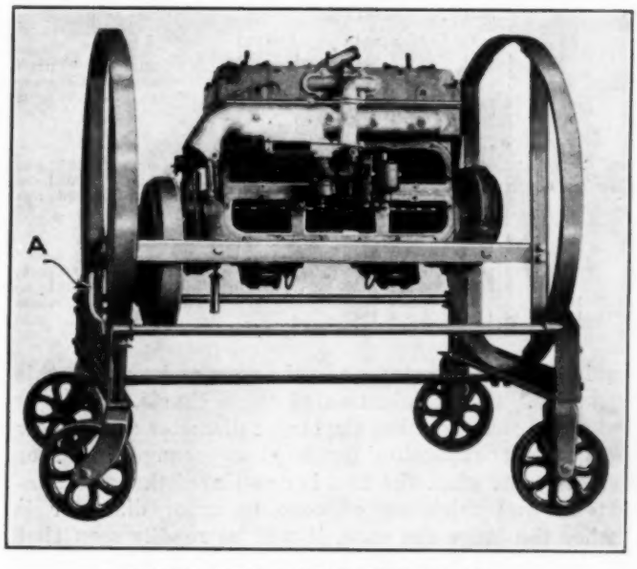


FIG. 9. THE ASSEMBLING STAND

Painting Machine Tools White

By Ellsworth Sheldon

In one of our old-time stage "dramas" the funny boy advises the farmer that "if you want your house yaller, put on yaller paint." D. A. Nevin, on page 166 of American Machinist, evidently believes that I am putting forward the same axiom with respect to white machine tools.

A machine tool painted with ordinary white paint will soon become "yaller" without further attention, especially if much oil is used around it. In my previous letter I stated that the machines in question were coated with a hard surfaced enamel paint that is impervious to oil. Several of the machines in the shop mentioned were thus treated more than a year ago and are still white.

It takes no more time to keep a white machine *clean* than it does a black one; but the black machine may be far from clean without the fact being evident to casual inspection.

Wage Scale in Southern Shops

A schedule of the average wages paid by the foundries and machine shops of the South has recently been compiled by the Southern Metal Trades Association. The schedule is based on an investigation of the wage scales in use in more than seventy of the leading foundries and shops of the Southern territory.

The average minimum and maximum wages per hour of the various trades is as follows: Coremakers, 0.495 to 0.586; moulders, 0.507 to 0.654; moulder's helpers, 0.232 to 0.286; machinists, 0.527 to 0.677; apprentices, 0.259 to 0.35; patternmakers, 0.624 to 0.71; blacksmiths, 0.654 to 0.698; boilermakers, 0.586 to 0.689; colored labor, 0.207 to 0.263; electricians, 0.558 to 0.611; welders, 0.614 to 0.632; pipe fitters, 0.511 to 0.589; sheet-metal workers, 0.515 to 0.653; carpenters, 0.471 to 0.573; cupola tenders, 0.342 to 0.345; millwrights, 0.567 to 0.644.

Mounting Ball Bearings

Undue Pressure in Mounting Deforms the Bearings and Renders Them Noisy in Operation —Maximum, Minimum and Average Safe Allowances for Fits

By T. C. DELAVAL-CROW

THE ball bearing trade has adopted tolerances on the bore, outside diameter and assembled width of bearings as standardized by the Society of Automotive Engineers; but considerable difference in opinion seems to exist among the users of ball bearings as to the fits allowable on shafts and in housings, the tolerances varying with the different users from a press fit to a light push fit, even though the bearing installation is of the same nature. In view of the fact that a bearing can have imposed on it an initial load caused by the expansion of the cone race or deformation of the cup race due to excessive press fits in or on their respective carriers, also that in the complaints by automobile transmission makers as to noise, it has been proved in nearly all cases that this noise can be traced to the use of excessive press fits for mounting cup or cone and that this noise can be reduced by reduction of the fits used or the use of a looser bearing which will allow for the expansion caused by the excessive press fits. Noise is vibration and it is readily seen that the higher the tension of the parts, the higher the vibration, which will cause a higher pitch or shriller tone to the noise produced. This is the effect which is produced in a ball bearing when the parts are assembled under tension. No maker of machine parts would think of pressing a bushing into a hole or on a shaft without either making the running clearance large enough to take care of the contraction or expansion, or perhaps use the better practice of reaming out or machining the bushing after assembly. But the same user will probably press a ball bearing onto the shaft or in the housing with a relatively large press fit and yet expect the bearing to function without failure and lack of noise.

With these points in mind, an investigation was undertaken to determine the expansion of the cone ball race due to mounting fits. In running this test, average size cones of the light, medium and heavy series were used, the sizes being as follows: No. 5, bore 0.9843 in.; No. 7, bore 1.3780 in.; No. 10, bore 1.9685 in.; No. 17, bore 3.3465 in.

The method used to obtain the expansion was to have hardened and ground taper arbors, the change in diameter being 0.0005 in. per inch, rings being ground on the arbor every inch for the convenience of measuring. Cones were then ground whose bore had the same amount of taper in order to obtain equal expansion on all parts of the cone, the arbor being lubricated with a light oil and the cone pressed on by hand until slight resistance was felt. The diameter of the ball race was then measured with an amplifying gage reading to 0.0001 in. and the diameter noted. The cone was then pressed on the arbor under an Olsen testing machine for a distance of 1 in., or change in arbor diameter of 0.0005 in. and the increase in diameter measured on ball race, record also being taken of the pounds pressure required to press arbor in cone. The point at which the diameter was measured was marked so that all measurements might be taken at the same position and thus eliminate any out-of-roundness or false readings that might occur. This operation was repeated as far as it was thought wise without causing the cone to fracture. The same method was followed on pressing the cone off the arbor but the readings were so near those obtained by pressing on that they were ignored. It is interesting to note that the highest expansion obtained did not cause the cone to fracture or produce any permanent set provided the cone was immediately pressed off, but if the cone was left on the arbor for twenty-four hours at its point of highest expansion, it was found that the cone in most cases was split in half.

Charts Nos. 1, 2, 3 and 4 show the expansion for the light, medium and heavy series of the various bore sizes tested in comparison to the change in arbor diameter.

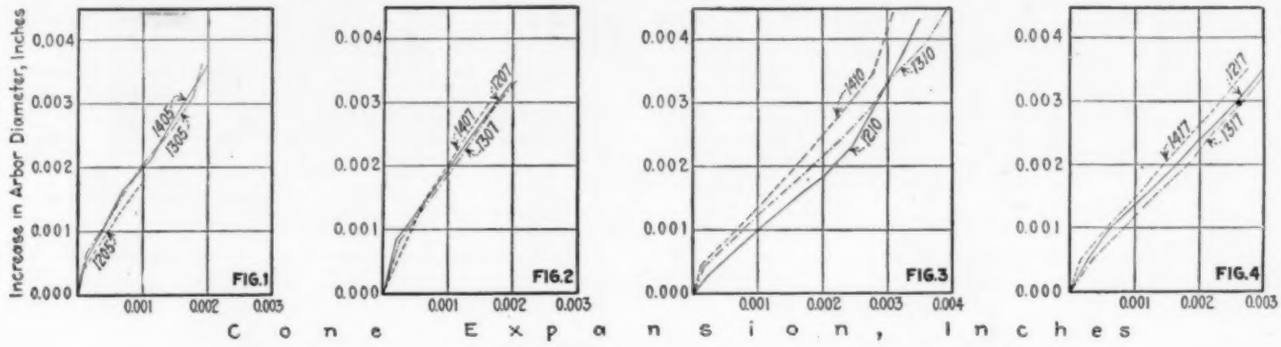
Chart No. 5 shows the average expansion obtained on the various bores; also, the average pounds pressure required to force the arbor in the cone and produce this expansion. On examination of these charts, it will at first appear strange that the larger diameter cones show the greatest expansion for a given change in arbor diameter, but when the fact is considered that the relation of wall thickness of cone to arbor diameter is smaller the large the cone, it will be readily seen that this is true, as naturally a very thin ring with a given

TABLE I. SHAFT-DIAMETER, SHAFT STATIONARY

No.	Bearing Bore M/M	Bearing Bore Inches	Shaft Diameter Max.	Shaft Diameter Min.	Fit Obtained	
0	10	0.3937	0.3934	0.3931		
1	12	0.4724	0.4721	0.4718	Maximum	0.0008 loose
2	15	0.5906	0.5903	0.5900	Minimum	0.0001 tight
3	17	0.6693	0.6690	0.6687	Average	0.0002 loose
4	20	0.7874	0.7871	0.7868		
5	25	0.9843	0.9840	0.9835		
6	30	1.1811	1.1808	1.1803		
7	35	1.3780	1.3777	1.3772	Maximum	0.0010 loose
8	40	1.5748	1.5745	1.5740	Minimum	0.0001 tight
9	45	1.7717	1.7714	1.7709	Average	0.0003 loose
10	50	1.9685	1.9682	1.9677		
11	55	2.1654	2.1649	2.1644		
12	60	2.3622	2.3617	2.3612	Maximum	0.0012 loose
13	65	2.5591	2.5586	2.5581	Minimum	0.0000 loose
14	70	2.7559	2.7554	2.7549	Average	0.0005 loose
15	75	2.9528	2.9523	2.9518		
16	80	3.1496	3.1489	3.1483		
17	85	3.3465	3.3458	3.3452		
18	90	3.5433	3.5426	3.5420	Maximum	0.0015 loose
19	95	3.7402	3.7395	3.7389	Minimum	0.0001 loose
20	100	3.9370	3.9363	3.9357	Average	0.0008 loose
21	105	4.1339	4.1332	4.1326		
22	110	4.3307	4.3300	4.3294		

TABLE II. SHAFT-DIAMETER, SHAFT ROTATING

No.	Bearing Bore M/M	Bearing Bore Inches	Shaft Diameter Max.	Shaft Diameter Min.	Fit Obtained	
0	10	0.3937	0.3940	0.3937		
1	12	0.4724	0.4727	0.4724	Maximum	0.0007 press
2	15	0.5906	0.5909	0.5906	Minimum	0.0002 loose
3	17	0.6693	0.6696	0.6693	Average	0.0004 press
4	20	0.7874	0.7877	0.7874		
5	25	0.9843	0.9848	0.9843		
6	30	1.1811	1.1816	1.1811		
7	35	1.3780	1.3785	1.3780	Maximum	0.0009 press
8	40	1.5748	1.5753	1.5748	Minimum	0.0009 loose
9	45	1.7717	1.7722	1.7717	Average	0.0005 press
10	50	1.9685	1.9690	1.9685		
11	55	2.1654	2.1658	2.1653		
12	60	2.3622	2.3626	2.3621	Maximum	0.0009 press
13	65	2.5591	2.5595	2.5590	Minimum	0.0003 loose
14	70	2.7559	2.7563	2.7558	Average	0.0004 press
15	75	2.9528	2.9532	2.9527		
16	80	3.1496	3.1499	3.1493		
17	85	3.3465	3.3468	3.3462		
18	90	3.5433	3.5436	3.5430	Maximum	0.0009 press
19	95	3.7402	3.7405	3.7399	Minimum	0.0005 loose
20	100	3.9370	3.9373	3.9367	Average	0.0003 press
21	105	4.1339	4.1342	4.1336		
22	110	4.3307	4.3310	4.3304		



FIGS. 1, 2, 3 AND 4. EXPANSION OF CONES WHEN PRESSED ON TAPER ARBOR

bore diameter would expand more for a given change in arbor diameter than a thicker ring would. The reason that the expansion on the seventeen bore cone is less than the ten bore is due to the change in relation of the thickness of the cone between the bottom of the ball race and the bore compared with arbor diameter.

Concerning the possible contraction of cup due to mounting, it was found very hard to measure the change in diameter due to out-of-roundness produced; also, it is much harder to compress a ring than expand it due to its shape. Again, it is very seldom that cups are mounted under a press fit condition and it is thought, bearing this fact in mind and the unreliability of the reading obtained, that the results would be of no value. It is well to note, however, that especially on the lighter cup if a press fit is deemed necessary due to shock loads or other conditions, this fit should be of as light a nature as possible as the housing is very seldom ground and is probably of an irregular shape, this shape being transmitted to the ball race under a press fit condition, causing high and low points which might result in failure due to an excessive initial load, and also be productive of noise because of the change in vibration set up as the balls enter under these high and low points.

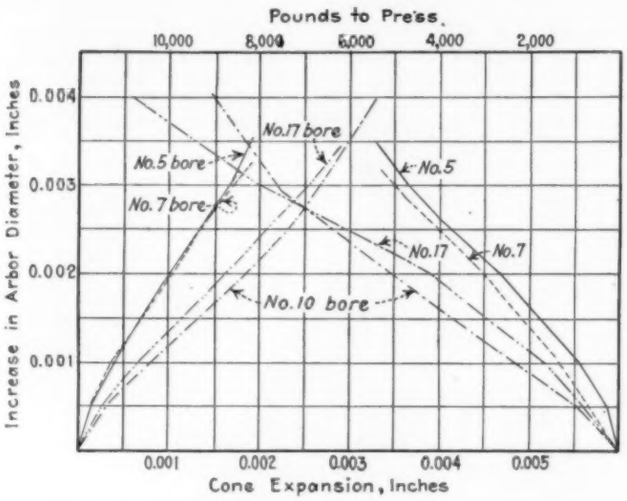
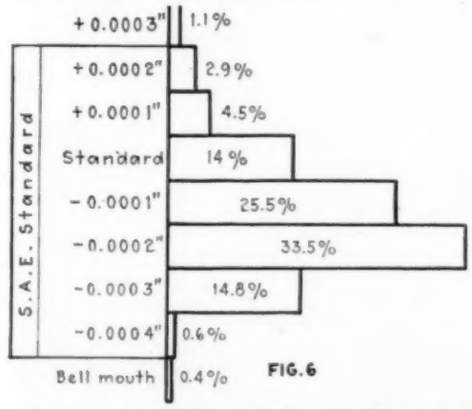


FIG. 5. COMPARISON OF AVERAGE VALUES OF CHARTS 1, 2, 3 AND 4

Having established the effect of press fit on the ball races, we can now determine a set of mounting limits that will cause the least trouble due to expansion and enable the bearings to be assembled with the correct amount of radial play to produce long life and a noiseless bearing.

Charts 8, 9, 10 and 11, and Tables I, II, III and IV give the limits recommended for shafts and housings, also the maximum, minimum and average fits obtained, and on charts compared to the limits established by the Society of Automotive Engineers on bore and outside diameter. It is well to note that contrary to most recommendations the maximum press fit decreases as the diameter increases. This is correct considering the fact that the more surface in contact the greater the friction and, therefore, the less fit required to hold the cup or cone in place, or a larger clearance required if a push fit is desired. This is also in accordance with the theory that a small fit is required on the larger sizes to prevent excessive expansion or contraction.

Whereas the maximum press and loose fits shown may appear excessive, it is true that according to the law of probability perhaps not more than 5 per cent of the extreme manufacturing allowances will ever be as-



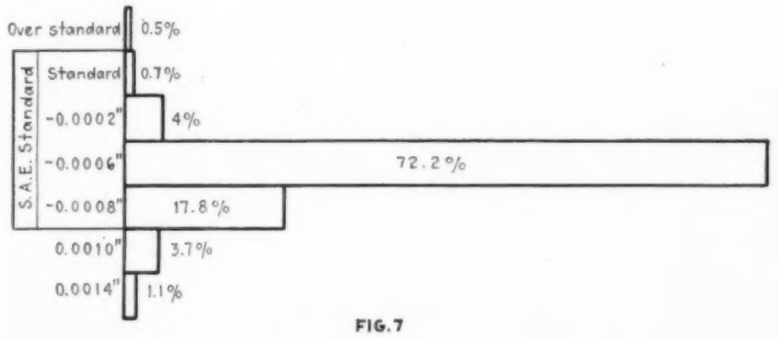
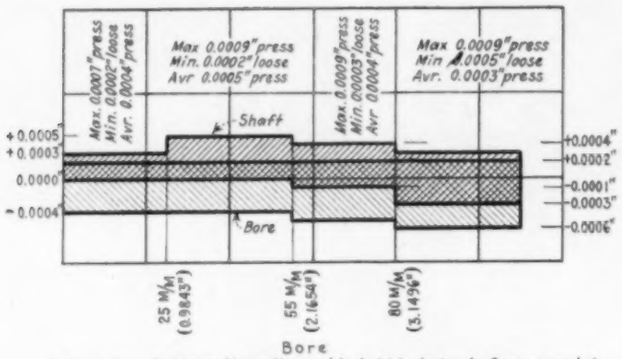
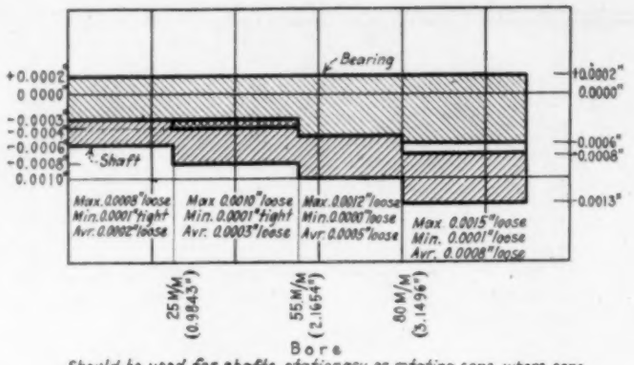


FIG. 6. ACTUAL BORE DIAMETERS OF SINGLE ROW CONES IN COMPARISON WITH S. A. E. STANDARDS. FIG. 7. ACTUAL OUTSIDE DIAMETER OF SINGLE ROW BEARINGS IN COMPARISON WITH S. A. E. STANDARDS



Cones mounted on soft shafts must be held by lock nuts. Cones mounted on hardened shafts need not be held by lock nuts, excepting light series, and where sustaining end thrust in two directions on bores smaller than 25 M/M (0.9843") a press fit of 0.0003" is preferable and should be obtained by selective assembly.

FIG. 8



Should be used for shafts stationary or rotating cone, where cone is moved for adjustment

FIG. 9

FIG. 8. BEARING FITS ON SHAFTS (SHAFTS ROTATING). FIG. 9. BEARING FITS ON SHAFTS (SHAFTS STATIONARY)

sembled together. Again, bear in mind that under average manufacturing conditions the operator intends to play safe and will grind shafts nearer the high limit and bore housings nearer the low limit so that in the event of his making an error he will still have stock enough left to remove and save the part. This is borne out by Charts Nos. 6 and 7 that show in grinding bores, 73 per cent of the New Departure bearings are from standard to minus 0.0002 in. and 15 per cent from standard to minus 0.0002 to 0.0003 in. on the outside diameter, 77 per cent of the bearings being ground from standard to minus 0.0006 in. and 18 per cent from minus 0.0006 to 0.0008 in.

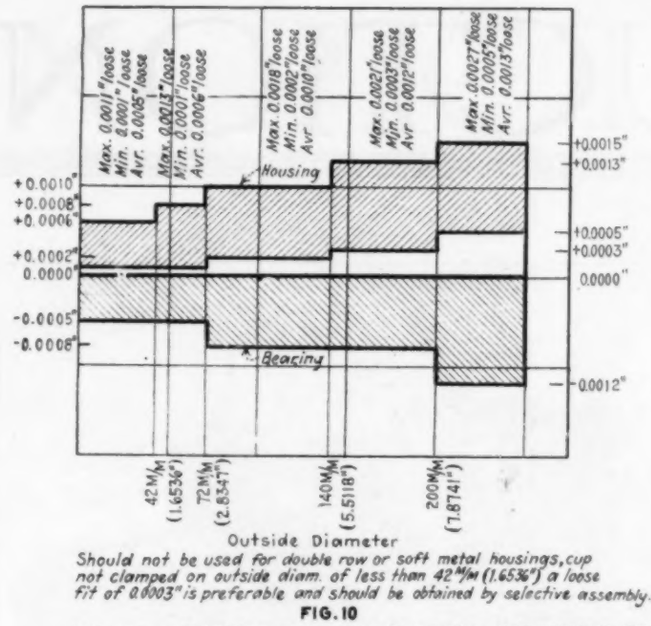
Using this information it is very easy to determine average fits obtained which are those shown on Charts 8, 9, 10 and 11.

TABLE III. HOUSING-BORE, HOUSING STATIONARY

Bearings No.	Brg. Out. Dia. M/M	Brg. Out. Dia. Inches	Housing Bore Max.	Housing Bore Min.	Fit Obtained
1200–200	30	1.1811	1.1817	1.1812	
1201–201	32	1.2598	1.2604	1.2599	
1202–202	35	1.3780	1.3786	1.3781	Max. 0.0011 loose Min. 0.0001 loose Avr. 0.0005 loose
1300–300					
1301–301	37	1.4567	1.4573	1.4568	
1203–203	40	1.5748	1.5754	1.5749	
1302–302	42	1.6536	1.6544	1.6537	
1204–204	47	1.8504	1.8512	1.8505	Max. 0.0013 loose Min. 0.0001 loose Avr. 0.0006 loose
1303–303					
1205–205–0205	52	2.0473	2.0481	2.0474	
1304–304–0304					
1206–206–0206	62	2.4410	2.4418	2.4411	
1305–305–0305					
1207–207–0207					
1306–306–0306	72	2.8347	2.8357	2.8349	
1404–404–0404					
1208–208–0208					
1307–307–0307	80	3.1496	3.1506	3.1498	
1405–405–0405					
1209–209–0209	85	3.3465	3.3475	3.3467	
1210–210–0210					
1308–308–0308	90	3.5433	3.5443	3.5435	
1406–406–0406					
1211–211–0211					Max. 0.0018 loose Min. 0.0002 loose Avr. 0.0010 loose
1309–309–0309	100	3.9370	3.9380	3.9372	
1407–407–0407					
1212–212–0212					
1310–310–0310	110	4.3307	4.3317	4.3309	
1408–408–0408					
1213–213–0213					
1311–311–0311	120	4.7244	4.7254	4.7246	
1409–409					
1214–214–0214	125	4.9213	4.9223	4.9215	
1215–215–0215					
1312–312	130	5.1181	5.1191	5.1183	
1410–410					
1216–216–0216					
1313–313	140	5.5118	5.5131	5.5121	
1411–411					
1217–217–0217					
1314–314	150	5.9055	5.9068	5.9058	
1412–412					
1218–218–0218					Max. 0.0021 loose Min. 0.0003 loose Avr. 0.0012 loose
1315–315	160	6.2992	6.3005	6.2995	
1413–413					
1219–219–0219	170	6.6929	6.6942	6.6932	
1316–316					
1220–220–0220					
1317–317	180	7.0866	7.0879	7.0869	
1414–414					
1221					
1318–318	190	7.4804	7.4817	7.4807	
1415					
1222					
1319–319	200	7.8741	7.8756	7.8746	
1416					
1417	210	8.2678	8.2693	8.2683	Max. 0.0027 loose Min. 0.0005 loose Avr. 0.0013 loose
1320–320	215	8.4646	8.4661	8.4651	
1321–321	225	8.8583	8.8598	8.8588	
1418					
1322–322	240	9.4489	9.4504	9.4494	
1419	250	9.8426	9.8441	9.8431	
1420	265	10.4331	10.4346	10.4336	

TABLE IV. HOUSING-BORE, HOUSING REVOLVING

Bearings No.	Brg. Out. Dia. M/M	Brg. Out. Dia. Inches	Housing Bore Max.	Housing Bore Min.	Fit Obtained
1200–200	30	1.1811	1.1809	1.1805	
1201–201	32	1.2598	1.2596	1.2592	Max. 0.0006 press Min. 0.0003 loose Avr. 0.0002 press
1202–202	35	1.3780	1.3778	1.3774	
1300–300					
1301–301	37	1.4567	1.4565	1.4561	
1203–203	40	1.5748	1.5746	1.5742	
1302–302	42	1.6536	1.6535	1.6528	
1204–204	47	1.8504	1.8503	1.8496	Max. 0.0008 press Min. 0.0004 loose Avr. 0.0003 press
1303–303					
1205–205–0205	52	2.0473	2.0472	2.0465	
1304–304–0304					
1206–206–0206	62	2.4410	2.4409	2.4402	
1305–305–0305					
1207–207–0207					
1306–306–0306	72	2.8347	2.8343	2.8335	
1404–404–0404					
1208–208–0208					
1307–307–0307	80	3.1496	3.1492	3.1484	
1405–405–0405					
1209–209–0209	85	3.3465	3.3461	3.3453	
1210–210–0210					
1308–308–0308	90	3.5433	3.5429	3.5421	Max. 0.0012 press Min. 0.0004 loose Avr. 0.0004 press
1406–406–0406					
1211–211–0211					
1309–309–0309	100	3.9370	3.9364	3.9358	
1407–407–0407					
1212–212–0212					
1310–310–0310	110	4.3307	4.3303	4.3295	
1408–408–0408					
1213–213–0213					
1311–311–0311	120	4.7244	4.7240	4.7232	
1409–409					
1214–214–0214	125	4.9213	4.9209	4.9201	
1215–215–0215					
1312–312	130	5.1181	5.1177	5.1169	
1410–410					
1216–216–0216					
1313–313	140	5.5118	5.5115	5.5105	
1411–411					
1217–217–0217					
1314–314	150	5.9055	5.9052	5.9042	
1412–412					
1218–218–0218					Max. 0.0013 press Min. 0.0005 loose Avr. 0.0005 press
1315–315	160	6.2992	6.2989	6.2979	
1413–413					
1219–219–0219	170	6.6929	6.6926	6.6916	
1316–316					
1220–220–0220					
1317–317	180	7.0866	7.0863	7.0853	
1414–414					
1221					
1318–318	190	7.4804	7.4801	7.4791	
1415					
1222					
1319–319	200	7.8741	7.8738	7.8728	
1416					
1417	210	8.2678	8.2675	8.2665	Max. 0.0013 press Min. 0.0004 loose Avr. 0.0006 press
1320–320	215	8.4646	8.4643	8.4633	
1321–321	225	8.8583	8.8580	8.8570	
1418					
1322–322	240	9.4489	9.4486	9.4476	
1419	250	9.8426	9.8423	9.8413	
1420	265	10.4331	10.4328	10.4318	



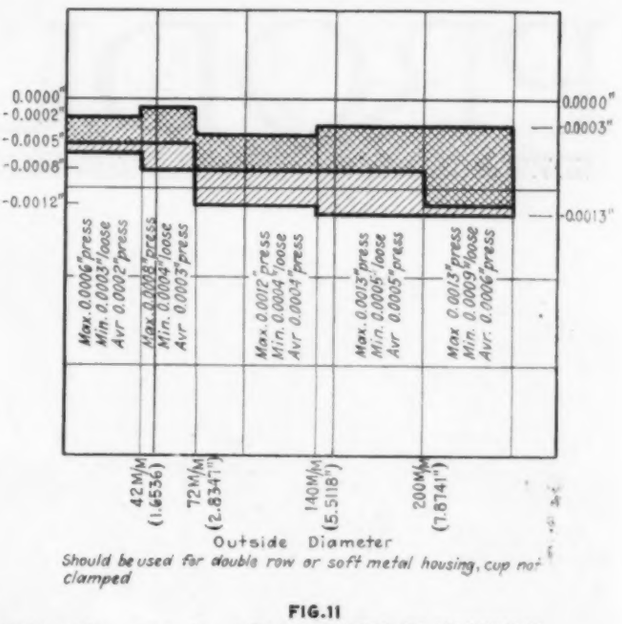


FIG. 10. BEARING FITS IN HOUSINGS (HOUSINGS STATIONARY). FIG. 11. BEARING FITS IN HOUSINGS (HOUSINGS REVOLVING)

In mounting cones on soft shafts, it has been found by experience that the cones must be securely clamped by locknuts in order to prevent peening in of the cone on the shaft due to the concentrated load on the short shaft length corresponding to the bearing width. In cones mounted on hardened shafts the parts need not be held by locknuts except the light series and where sustaining end thrust in two directions, or, in the case of their being subjected to very excessive shock loads. In the event of the shaft being stationary, the light push fit shown in Chart 9 should be used in order to allow a slow intermittent creep which will allow the cone to present a different portion of its surface to load and so obtain equal wear. The outer race with housing stationary should be a loose push fit as shown in Chart 10 for the same reasons given as for a non-rotating cone. Also, it is impossible in assembly to be sure that the parts are not assembled out of line due to the narrow width of the bearing compared to the diameter as it is a certainty that the outer race will be cramped if assembled with a press fit and without special aligning fixtures. Cups mounted in soft metal housings, if not clamped endwise, should use fits given on Chart 11 to prevent peening of the housing. Chart II is also for fits of cups in housing with the housing revolving.

Enlarging Gas Engine Pistons by Plating Them

BY DAVID TYKE

Some time ago the writer was called upon to fit new pistons to an automobile of uncertain years and origin, but when the question of cost entered into the conversation the owner, comparing the figure with the price of standard oversize pistons of regular manufacture, thought we were robbers.

I tried to explain to him the necessity for a pattern, the slower methods of machining and other elements of the strictly special job as compared with a regular manufacturing proposition on a production basis, but the most he would do was to "think it over."

While he was thinking I conceived the idea of giving those pistons, which were only about 0.006 in. too small, a heavy coat of nickel and thus increase their diameter by the desired amount. To this experiment the owner consented and the pistons were accordingly thoroughly cleaned and put into the copper-plating bath.

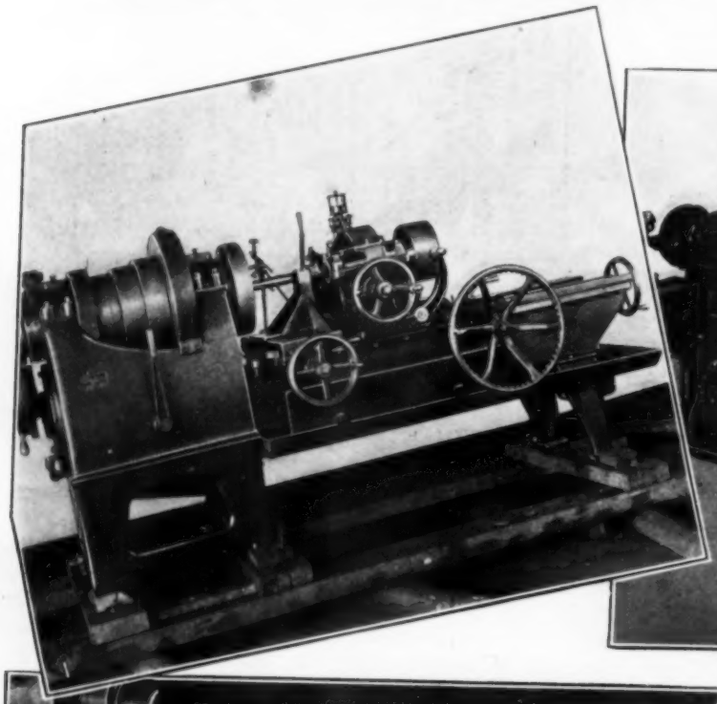
The copper was applied by electrical deposition, and the process was allowed to proceed very slowly, as this was considered advisable, until about half the necessary thickness was obtained. They were then transferred to the nickel bath and a sufficient amount of that metal added by the same process to build them up the required 0.006 in. in diameter.

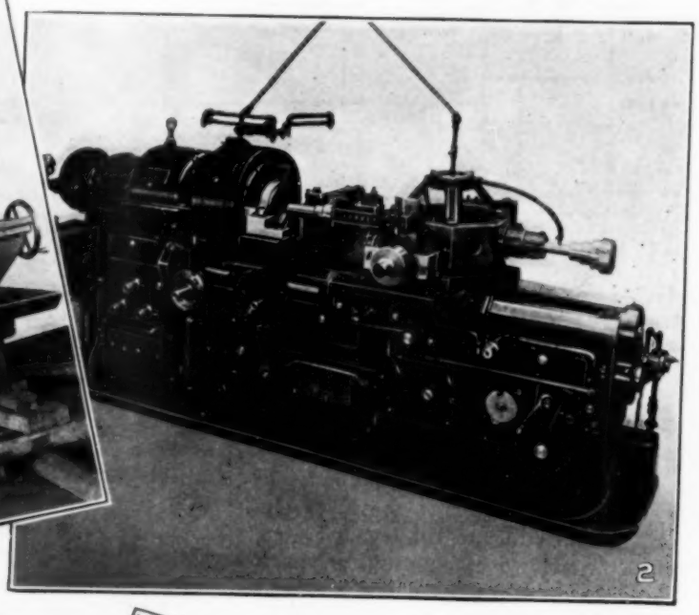
The plated pistons were then touched up on a buffing wheel and put into place in the engine. The time of the repair had not exceeded 24 hours altogether, and the owner expressed himself as well satisfied.

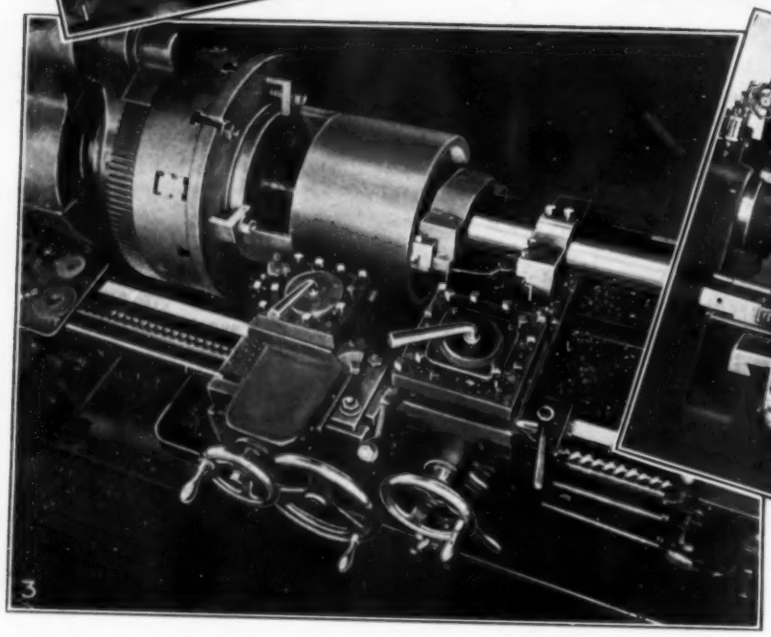
In view of the fact that there are tens of thousands of pistons deposited yearly in the scrap pile because they are four or five thousandths under size, would it not be a good idea to investigate this method of salvaging them?

[We frankly admit that this application of the "putting on" process is an entirely new one to us and we are not yet quite ready to order the pistons of our car nickel-plated, but—you never can tell! Who knows any more about it?—EDITOR.]

PRODUCTION







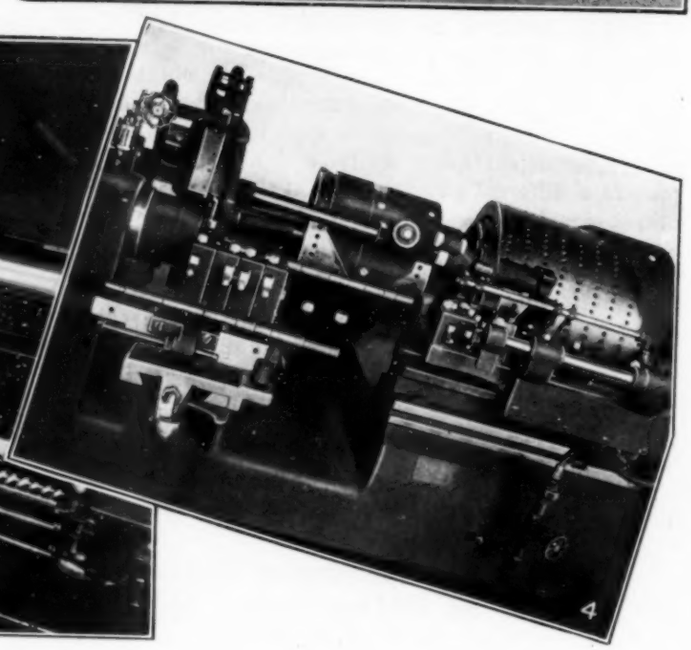


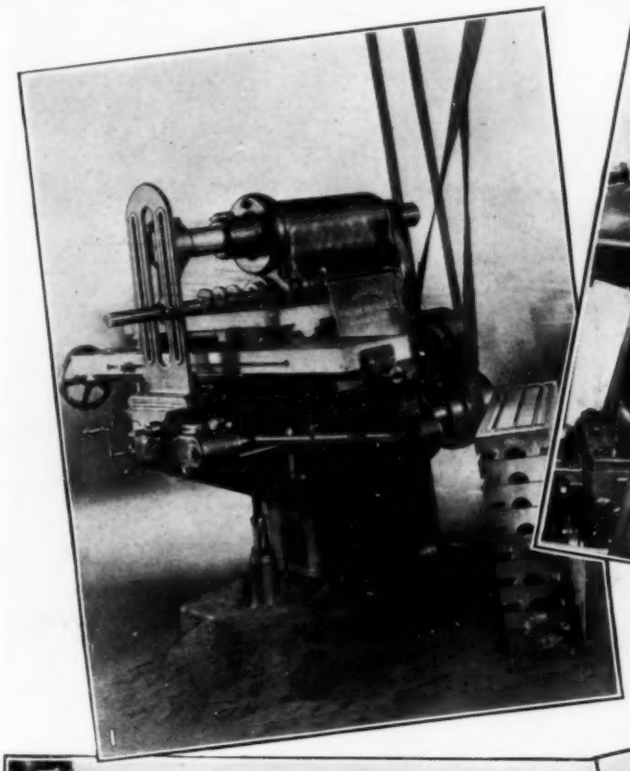
Fig. 1. For some kinds of work both the bolt cutting machine and the screw-cutting lathe have been superseded by the thread-milling machine. The Smalley thread-milling machine shown in the accompanying illustration is of a type that uses a hob instead of a disk cutter. The hob has no lead and is slightly longer than the thread to be milled. In machines of this type, threads are completed in one revolution of the work.

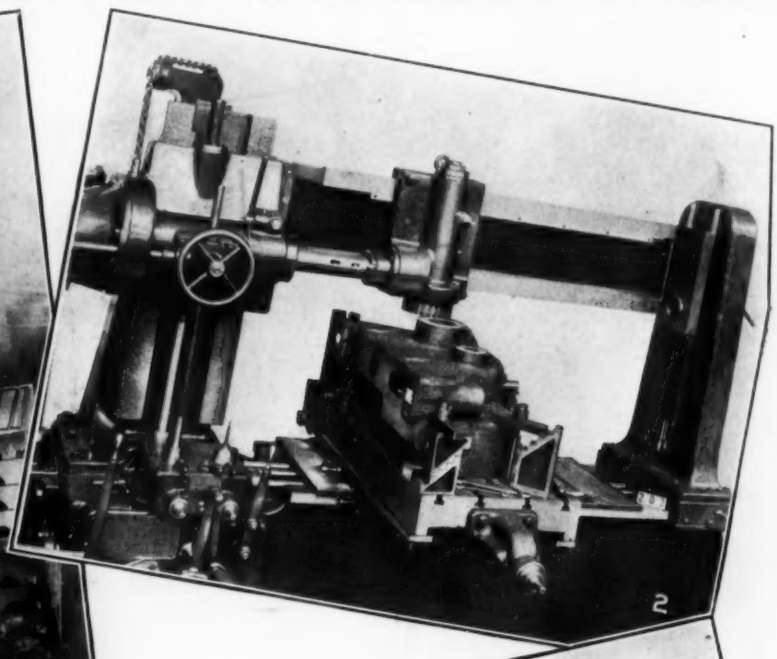
Fig. 2. Automatic turret lathes have reached a development never dreamed of by Spencer when he invented the automatic screw machine. The illustration herewith is of a Gisholt 20-in. automatic turret lathe, machining cast-steel commutator caps nearly 11 in. in diameter. The caps are finished all over in two operations and two chuckings in from 30 to 35 min. each.

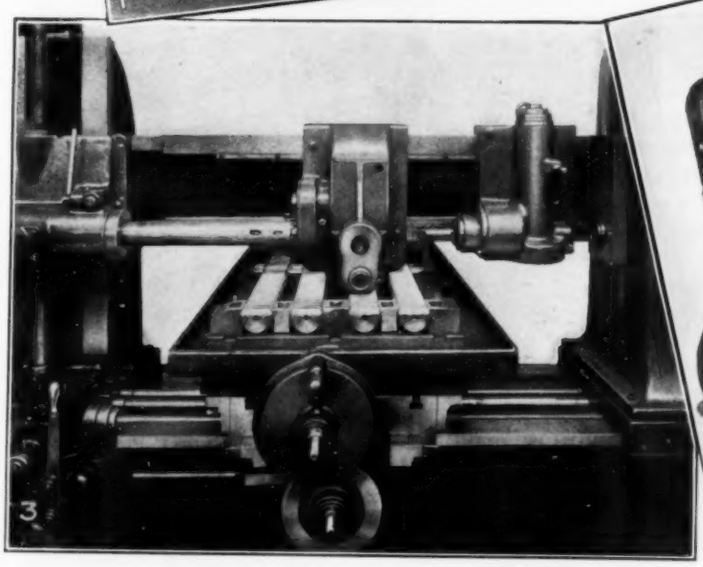
Fig. 3. The 24-in. Gisholt turret-lathe shown here is machining cast-steel motor frames. The work is 15⅞ in. in diameter and 17½ in. in length. The operations include the use of tools in both regular turret and turret toolpost. Machining is completed in 1 hr. 57 minutes.

Fig. 4. This automatic machine for turning shafts, built by the Cleveland Automatic Machine Co., is shown turning a 1 x 17-in. shaft having nine shoulders. The production is fifteen shafts per hour. The same machine was shown on page 92 of the current volume where the production was erroneously stated as four shafts per hour.

IN PICTURES







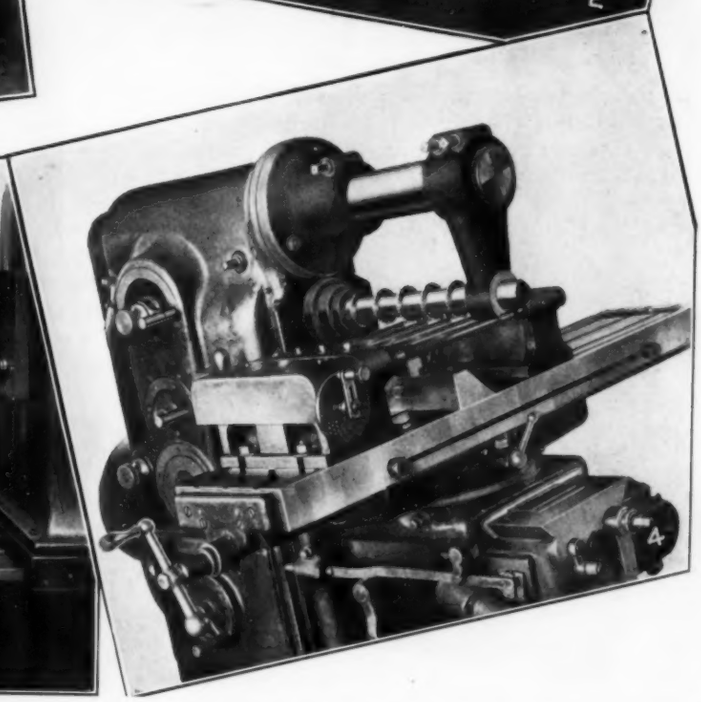


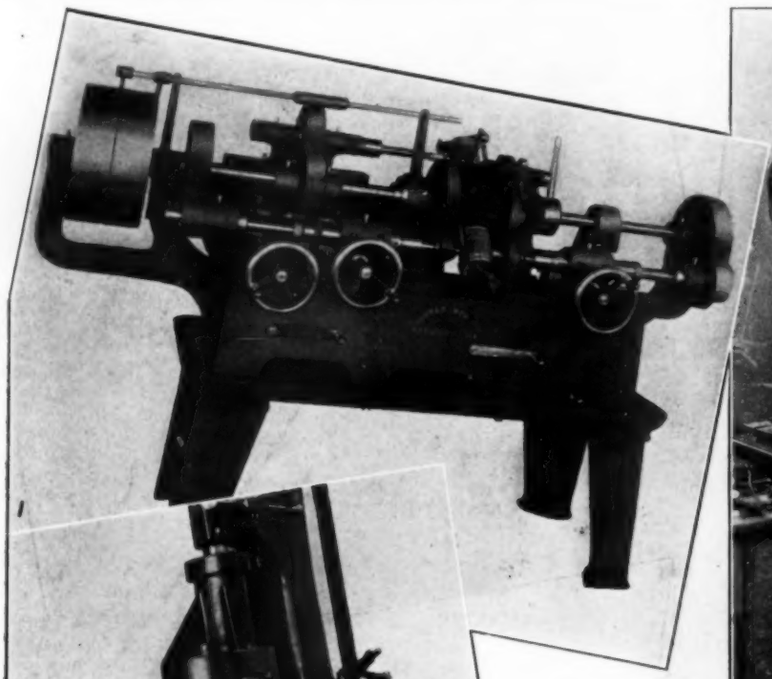
Fig. 1. The knee-type milling machine has come into its own for work that was considered too heavy for it a few years ago. The No. 2 Rockford milling machine shown in the accompanying illustration, mills three $\frac{7}{16}$-in. slots and two oil grooves 39 in. long in milling machine tables at the rate of twenty in 10 hours.

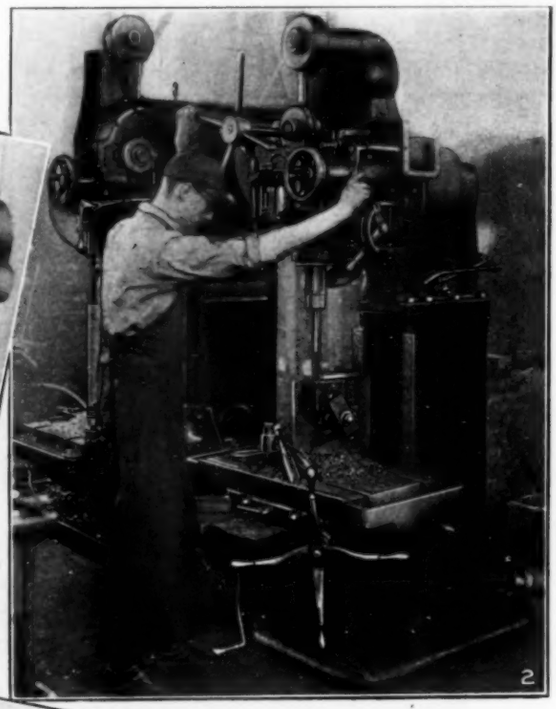
Fig. 2. The horizontal boring mill is capable of doing work other than that for which it was designed. Here is a Lucas boring mill equipped for milling. The heavy rail between the spindle head and the outer support, and the saddle with its vertical spindle are substantial affairs capable of withstanding heavy cuts.

Fig. 3. But few shops have enough rack cutting to employ a machine for that purpose alone. The Lucas horizontal boring mill shown in this illustration, besides being arranged with a vertical spindle for milling, has been fitted with a horizontal spindle and a special table for cutting racks in multiple. An index plate is, of course, part of the equipment.

Fig. 4. The Rockford milling machine to be seen in this illustration is equipped with a plain multiple-spindle indexing head having five spindles. The head swings $10\frac{1}{2}$ in. and the center distance between spindles is $2\frac{5}{8}$ in. The pieces of work shown in the machine are having keyways $\frac{3}{16}$ x $\frac{3}{16}$ x 22 in. cut in them. Production, 300 in ten hours.

PRODUCTION





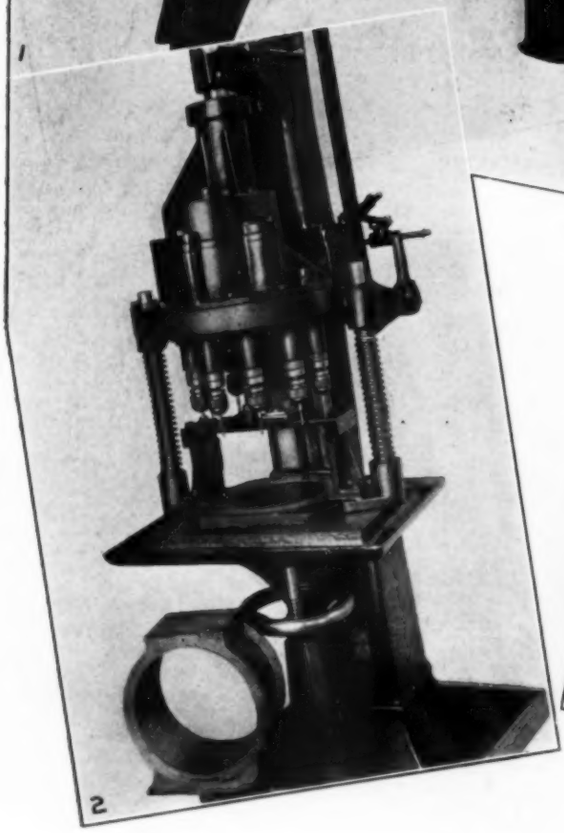


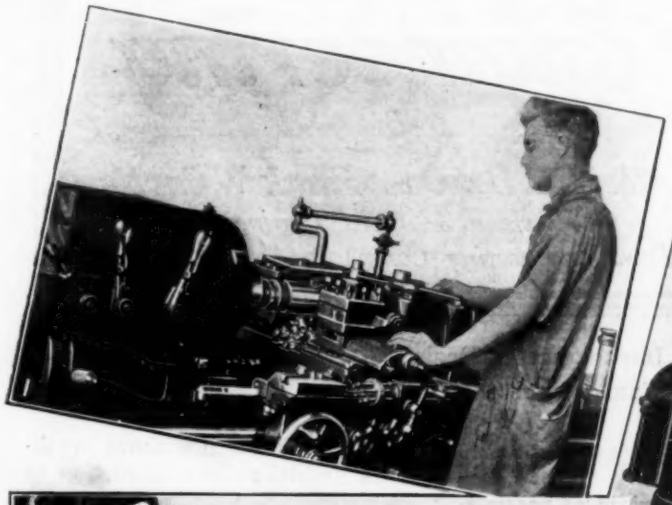
Fig. 1. The Hoefer horizontal drilling and reaming machine shown in this illustration was designed for drilling and reaming pin holes in automotive pistons. When the first piston has been drilled, the fixture is indexed to bring it to the reaming station and another piston put in place for drilling. From this time on both drilling and reaming are carried on simultaneously. The production is one piston per minute.

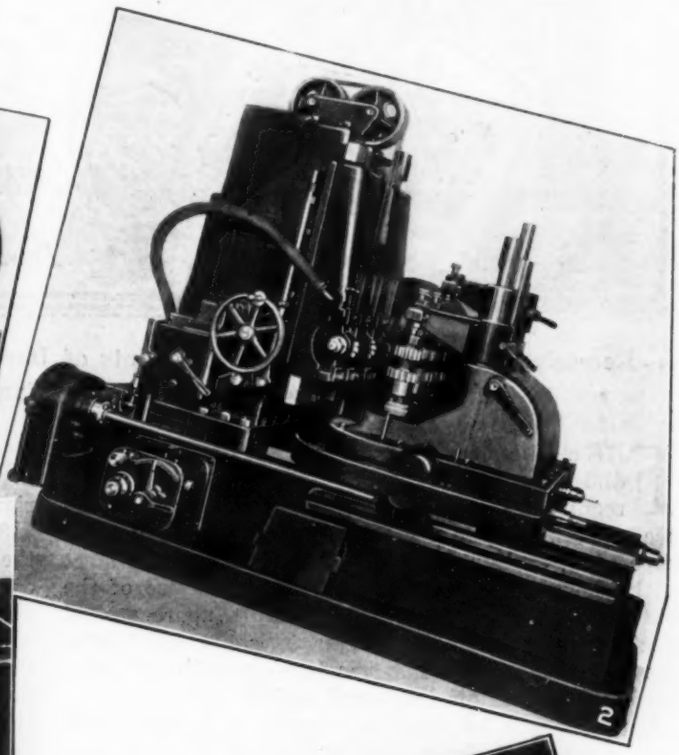
Fig. 2. This Colburn No. 14 high-speed drilling machine is tapping a $1\frac{7}{16}$-in. Acme thread in a nut for an elevating screw. The production is six per hour, including drilling the hole and putting through three taps.

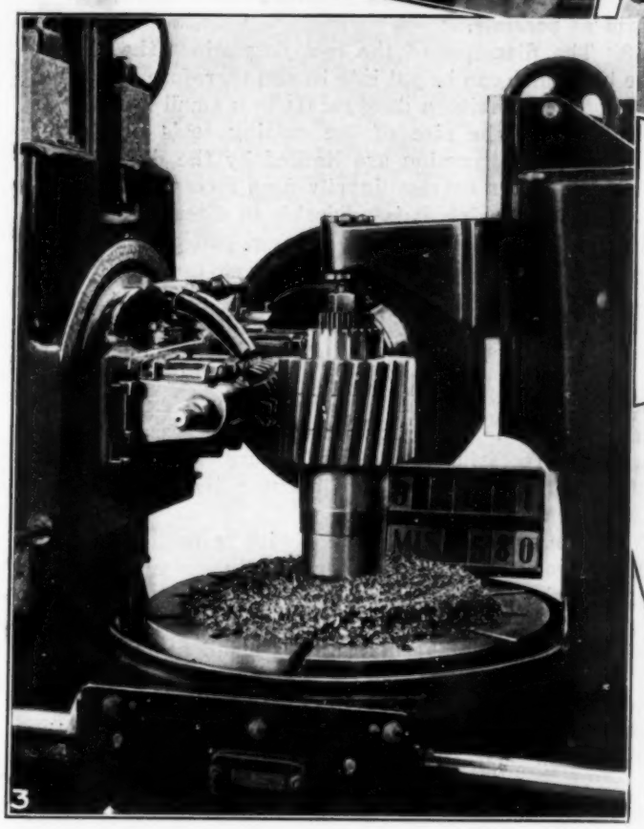
Fig. 3. Tapping by machine is done at a speed that would have been considered unbelievable a few years ago. Here is a Hoefer high-speed multi-spindle tapping machine arranged for tapping holes in the meter case to be seen at the base of the machine. Eleven holes are tapped in 15 seconds.

Fig. 4. The Morris radial drilling machine shown in the accompanying illustration is at work on a column cap for one of its brothers. Three $\frac{13}{16}$-in. holes are drilled and the bosses faced. Four holes varying from $\frac{1}{2}$ to 2 in. in diameter are drilled, reamed and the bosses faced. The time in lots of thirty pieces is one hour each. The different tools used on the work may be seen in the wooden case.

IN PICTURES







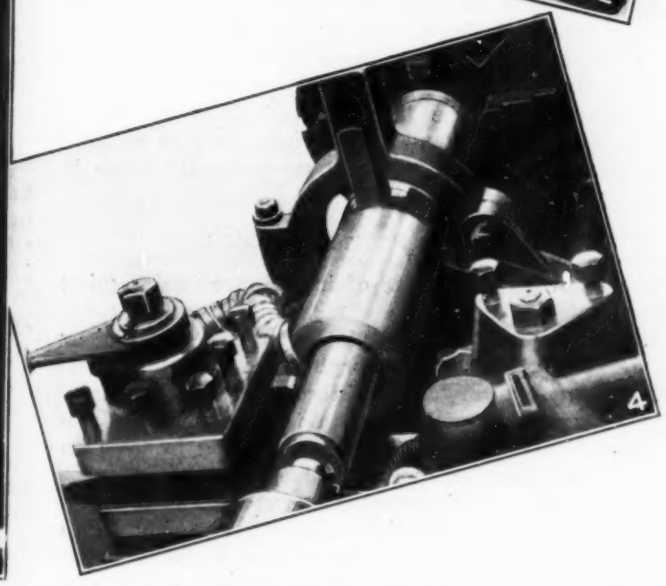
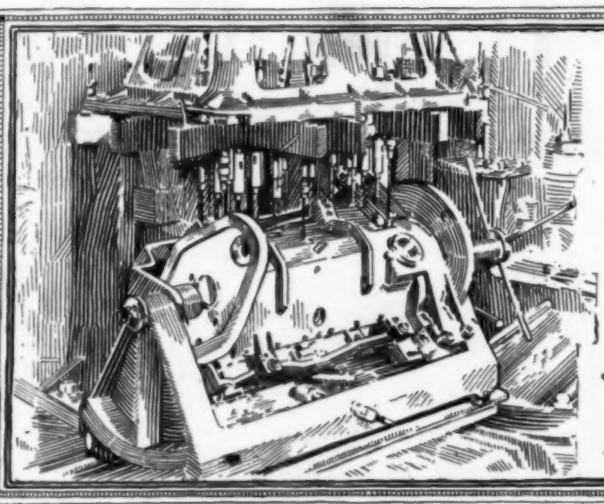


Fig. 1. The engine lathe of yesteryear has no place in production. The Lodge & Shipley "selective head" manufacturing lathe shown here is turning double-bevel gear blanks for 18-in. lathes. In this operation 13 lb. of metal is removed in 6 minutes.

Fig. 2. Gear cutting machines arranged with multiple work spindles and cutters are the result of intensive production methods. The Gould & Eberhardt No. 60-SM gear cutting machine to be seen in this illustration is cutting transmission gears. Each work spindle is independently adjustable so that gears on all three spindles can be cut to the same depth. This adjustable feature makes provision for using cutters having unequal diameters.

Fig. 3. Fast work can be done on the hobbing machine because the heat generated by cutting is well diffused. This Gould & Eberhardt No. 36-H hobbing machine is hobbing a chrome-nickel steel pinion of 3-diametral pitch. The face is 5 in. and the helix angle 7½ deg. The work is completed in one cut and the time is 30 minutes.

Fig. 4. Here is another Lodge & Shipley lathe of the same type as that shown in Fig. 1. The lathe is turning driving-shaft bearing nuts for machines of its own type from a solid bar. The tool set-up includes four tools in the turret toolblock and one in the high-duty toolblock.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Recessing Tools for Turret Lathes—Points of Importance in Design of Recesses and Tools—Recessing Tools Operated by Cams, Gears and Cross-slide

THE cutting of a recess in a hole is one of the most difficult operations for which a tool designer is required to design tools. It makes a great difference what kind of a recess is to be cut; the general shape of it, the width and the depth all have an effect on the design of tools for the work. The size of the hole in which the recess is cut also has a pronounced effect upon the method used, as it is obvious that a recessing tool for a small hole is so restricted in size that it necessarily must be small and delicate.

A recess may be required narrow and deep, or it may be wide and shallow; it may be cut in a piece of work of small size, or of large diameter; it may be close to the front end of the work, or it may be quite a distance inside the hole. All of these conditions influence the design, and may perhaps require entirely different methods of handling, due to the difference in sizes or shapes.

Important Points in Design

The following points are of importance in designing recessing tools:

1. The material which is to be cut may be hard or soft, and may be a casting, forging or bar stock. Tools used on cast iron are made differently from those used on steel, and the cutting action is also markedly different. If the work consists of a casting in which a cored recess has been made, and this recess is to be finished by a recessing tool, two cuts will usually be necessary on account of the scale in the casting. If a single tool is used, it will dull quickly and lose its shape very rapidly, so that it cannot be depended upon to produce accurate work. Fortunately, however, the majority of recess cuts are not held to a very close degree of accuracy. If the material is of steel or any other metal which requires a lubricant, it may be necessary to provide a means of supplying this lubricant to the cutting point.

2. The width and depth of the cut are important because of the rigidity required for a tool on this kind of work. A deep recess which is at the same time narrow apparently would not require the tool to be supported as rigidly as if the cut were wide; yet a tool for a recess of this kind cannot deflect much without breaking, so that it is essential to make the construction as rigid as possible.

3. The diameter of the tool determines the size of the bar which can be put into it, and therefore it is often difficult to machine a deep recess in a small hole. It is evident that the size of the cutting tools and other details of construction are limited by the diameter of the bar. When extraordinarily deep recesses are specified on a blueprint, it is advisable to discuss the situation with the engineer who is responsible for the design, and see if it is not possible to revise the drawing in such a way as to make the operation easier. This can often be done, providing the difficulty is found in the early stages of the work and before production is started. The shape of the recess and the permissible tolerances can also be modified to some extent, as a general thing. The greatest care is necessary in the design of recessing tools to make sure that the tool has sufficient clearance, so it will enter the hole without interference of any kind.

4. The position of the recess with respect to the face of the work makes a considerable difference in the design of the tooling. It is often difficult to machine a recess which is located some distance from the face of the work. When the diameter is small a condition of this sort becomes serious, and it may be necessary to revise the method used entirely, and even in some cases to cut the recess in a separate operation, or otherwise change the method of handling so as to do the work from the other end. Under certain conditions a piloted tool may be used, thus giving support where needed, but this is not always possible.

5. The rigidity of a recessing tool is very important, as any "chatter" is fatal to good results. If a long bar is used, it should be supported either by a pilot in a bushing, or by means of a special support on the cross-slide or the ways of the machine.

6. Adjustment of the tool should be provided for, not only in relation to the depth of the cut, but also for longitudinal position. There are occasional cases when the size of the hole is so small that there is very little opportunity to provide adjustment; but the matter should always be carefully thought of and everything possible done to take care of wear in the tool or changes

For the authors' forthcoming book. All rights reserved.

in the longitudinal position caused by slight errors in grinding. The longitudinal depth may be determined either by an adjustment of the turret stops, or by collars which strike the face of the work or some portion of the fixture or pilot bushing. Ordinarily, a recessing tool is not required to work on the scale of the casting, although in some cases it is necessary. In such an event, both roughing and finishing tools will be required if accurate work is to be obtained.

7. Recessing tools which are operated and controlled mechanically so as to have a positive action are to be preferred to those operated by springs. It is not always possible to control the tools in both directions by a positive movement, so that springs are often used. The designer should bear in mind that springs are not infallible, and endeavor to make his designs positive in their action.

Kinds of Recesses

A number of examples of work requiring recessing operations are shown in Fig. 319. There are doubtless many other forms which could be illustrated, but those shown cover the general requirements for this class of work. In the example *A* the work has a recess or pocket at *B*; and a piece of this kind is usually machined by a single-point tool either in a boring bar or in the cross-slide of the machine. It is possible to do the work with a sliding tool on the turret, using either hand or power feed, depending considerably upon the depth and diameter of the recess. Cases may be found where a piece of work like this will actually require a special tool mounted on the turret. For example, if the work were of large diameter and made of high-carbon steel, it might be difficult to machine it in any other way than by means of a single-point tool, in which case something special would need to be designed.

In the example *C* the recess *D* is rather deep and close to the front end of the work. If the diameter of the hole is large, no difficulty will be experienced in machining the groove. If the work is small, however, particular attention must be paid to the design so as to avoid "chatter." In the example *E*, the diameters *F* and *G* are bored and reamed, and the recess is cut at *H*. It is highly desirable to machine this recess in the same setting as that in which the holes *F* and *G* are machined. A piloted bar having a sliding recessing tool in it would probably be necessary for this piece of work.

Another condition is seen in the example *K*, in which the recess *L* is wide but very shallow. It would not be good practice to attempt to machine this surface with a tool the full width of the recess. It would be much better to use a boring tool which could be set over sufficiently to give the additional depth required. The turret could then be fed along to bore the diameter *L*, after which the tool could be set back again and removed from the work. The example at *M* shows a very common type of recess at *N*, the purpose of this groove being to allow clearance when cutting the threads indicated. No great accuracy is required for work of this kind, and any of the simpler types of tools can be used. In the case O an angular recess is cut at *P*, this groove being used for packing. Its dimensions are not, therefore, of the greatest importance, except that the depth should be approximately correct. The angular portion does not require great accuracy.

The work shown at *Q* has a recess cut at *R* at 45 deg. to the center line of the work. The purpose of this relief is to allow clearance for the tools used in finishing the tapered surface. It is only necessary to provide sufficient clearance for this purpose and the angularity is not particularly important. The work shown at *S* has a dovetailed groove at *T*. This is a very difficult piece of work, as the tool must be first fed in to the proper depth and then carried longitudinally backwards and forwards to remove the angular portion. Two methods are in use for work of this kind. The tool may be shaped to the form of the dovetail but narrow enough so that it will cut a little smaller than the narrowest width of the groove; then the tool can be fed backwards and forwards to produce the angle. The other way is to use two recessing tools, one of which cuts a square groove and the other machines the dovetail.

In the example *U* there are two recesses placed close together as shown at *V*. There is no particular difficulty in machining work of this sort, but it may be done in two ways: either by a single tool with adjustable stops or by two tools at the same time. A simple type of recessing tool will give good results if each groove is handled separately, but a special form will be necessary if both are done at one time.

In the example *W* there are two parts of a housing, and in each of these parts there is a recess, as shown at *X* and *Y*. The two halves are bolted together, with a gasket at *Z*, and the recesses are cut after assembly. There is a large hole in one side of the housing so that the tools are easily accessible. The spacing between the two recesses *X* and *Y* is very important, and in order to insure accuracy, a special finishing tool which cuts both recesses at the same time was found to be necessary.

Simple Recessing Tools

In considering the design of tools for recessing work, we shall take up the simplest forms first. Several of them are shown in Fig. 320. The work *A* has a recess at *B* close to the end of the work. The piece is held in chuck jaws, and a special holder *C* is mounted on the turret of the machine. This holder has a hole *D* in which the eccentric stem of the toolhead is carried. The stem is a running fit in the hole and is held in place by means of a nut and washer at *E*. The end of the toolhead is provided with a cutter at *F*, held in place by two setscrews at *G*, as shown in the cross-sectional view. Accurate adjustments are provided by means of the backing-up screw at *H*. This tool is designed to be fed by hand by means of the lever *K*, and suitable stops are provided to limit the movement, the stops being made adjustable if required.

It is sometimes necessary to chamfer the rear end of a hole, and the tool shown at *L* is designed for this purpose. It is automatic in its action, and is not intended to do anything more than break the inside corner of the hole. A tool of similar kind can be furnished with a cutter, to cut a recess when great accuracy is not required. The bar *M* is slotted at the end for a block *N*, which holds the cutter *O*. The block is pivoted at *P*, and provided with a coil spring to keep the cutter away from the work when not in use. A stop pin is inserted in the face of the chuck or faceplate, as shown at *Q*, and the cutter block *N* strikes this stop pin as the turret is moved forward, thus causing the tool to pivot and "break the corner," as indicated. The pivot point *P* must be far enough off center so that the pressure applied will cause the block to move easily. Applications of a tool like this can be made for many operations which do not require great accuracy.

Another simple form of a recessing tool which is likewise automatic in its action is shown at *R*. The bar *S* is mounted in some convenient way in a holder on the turret. The sliding collar *T* is slotted to receive the toolblock *U*. The end of the collar has in it a stop pin *V*, which strikes the bottom of the hole and gives the correct location. The toolblock has a pin at *W*, and the bar is slotted on an angle at *X*. When the tool is moved forward, the stop pin *V* strikes the bottom of the hole and the collar remains in position while the bar continues to move forward, thus compressing the coil spring *Y*, which holds the collar firmly against the bottom of the hole. The slot in the bar causes the tool to move outward radially and gradually cuts the recess. After the cut has been finished, the coil spring causes the tool to recede from the groove, so that it comes out of the work freely and without interference.

Applications of this same principle are frequently made on recessing tools. Care must be taken not to make the angle of the slot too great, as too much friction might be caused and the tool would fail to operate. In some cases it may be better to slot the tool block, while in others the bar itself may be slotted. The end of the collar may be provided with a revolving bushing of approximately the diameter of the work, to assist in supporting the tool when cutting a recess in a deep hole.

In Fig. 321 is illustrated an application of a form of recessing tool having a sliding member operated by a rack and pinion. The work has a recess *A* which is cut by means of a tool in the bar *B*. The bar is mounted in a sliding member *C*, dovetailed and gibbed at *D*. The body of the tool *E* has a shank *F*, which fits the turret. An adjustable stop is provided, so that the depth of the recess can be controlled. The operation is by means of a handle *G*, which moves a pinion meshing with a rack *H* on the side of the slide. Tools of this kind are useful for light cutting operations, and they may be standardized in such a way that they will cover a considerable range of work. It is only necessary to provide a bar and a suitable tool for any piece of work within the capacity of the device.

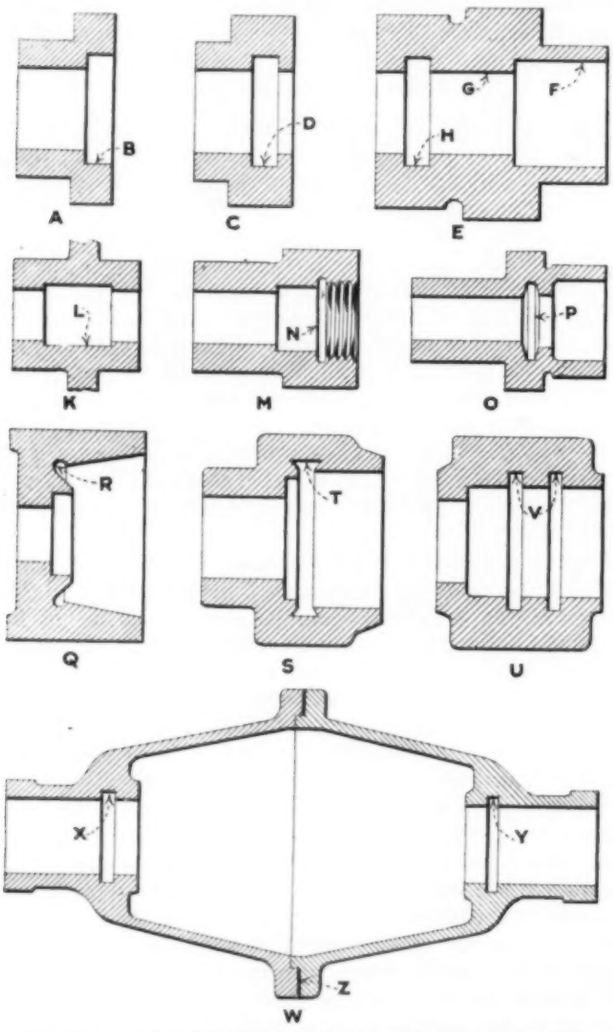


FIG. 319. WORK REQUIRING RECESSING OPERATIONS

CAM-OPERATED RECESSING TOOL

In Fig. 322 is shown a very good type of recessing tool which can be made cheaply and adapted to various kinds of recessing work. The body of the tool *A* is of cast iron, well ribbed up as indicated and fastened to the turret face. To this body a dovetailed slide *B* is fitted. A tapered gib, shown at *C*, is provided for adjustment. The sliding member contains a lug at *D* in which the tool *E* is held by means of setscrews, shown at *F*. The operation of the device is by means of a handle *G*, which revolves the cam *H*. This part acts against hardened plates at *K* and *L*, thus controlling the movement of the slide. Adjustment for depth is obtained by setting the screw *M*.

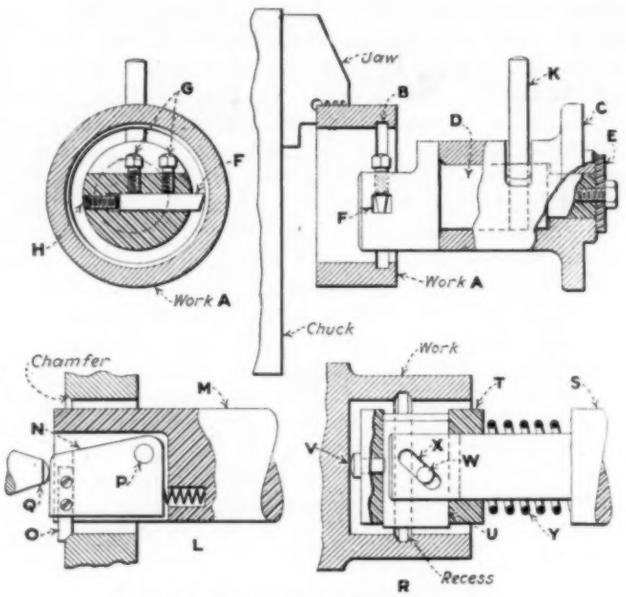


FIG. 320. SIMPLE RECESSING TOOLS

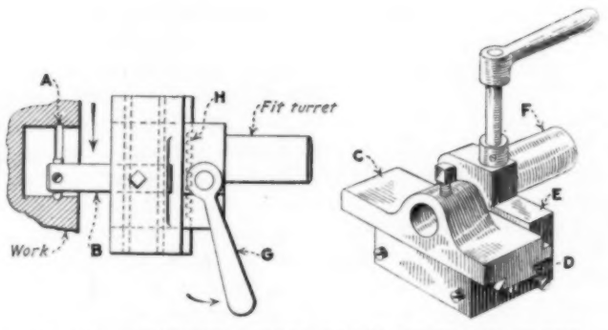


FIG. 321. RECESSING TOOL WITH DOVETAIL SLIDE

This tool is easily operated, and can be adapted to shallow recessing cuts which are close to the end of the work. By using a special design of tool, considerable latitude is possible. A design of this sort can be made with a considerable overhang from the turret if the tool is placed in the other side of the holder, so that the cutting action is downward instead of upward. A support can be provided on the cross-slide or the ways of the machine to assist in taking the thrust of the cut, thus making the mechanism considerably more rigid and capable of handling a heavier class of work.

The work shown at *A* in Fig. 323 has a recess cut

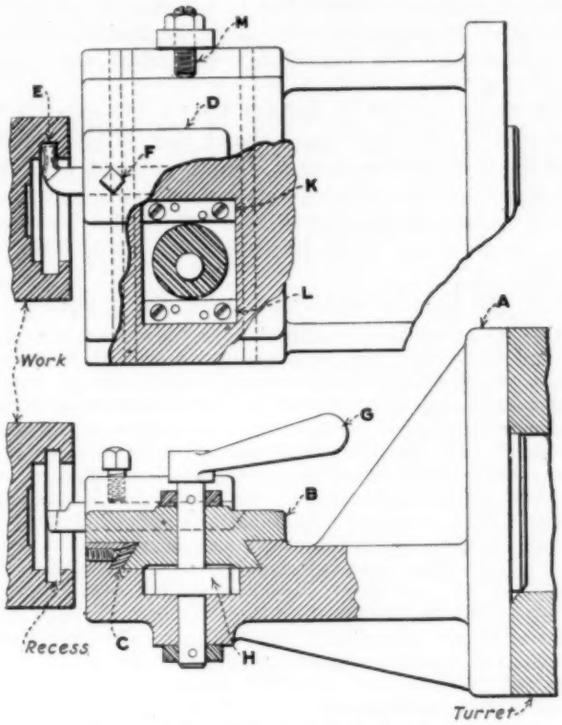


FIG. 322. CAM-OPERATED RECESSING TOOL

deeply in it a considerable distance from the face. This piece can be cut very satisfactorily by use of the cross-slide for support and feed. In the example shown, the work has been faced by tools on the front of the cross-slide, and there are other tools in the turret previously used for boring the hole. The recessing tool is simple in design; it works easily and produces excellent results. The turret is equipped with a casting *B* on which a dovetail is cut, as shown at *C*. The bar *D* is held on a sliding member *E*, which is fitted to the dovetail and provided with a tapered gib to permit adjustment for wear.

The cutter for the recess is shown at *F*, being of suitable shape for the form of the recess and being fitted to the bar *D*. Adjustment is provided by means of a backing-up screw in the ordinary way. The member *B* which fits the turret has a lug on it in which a setscrew is arranged at *G*, which allows a setting to

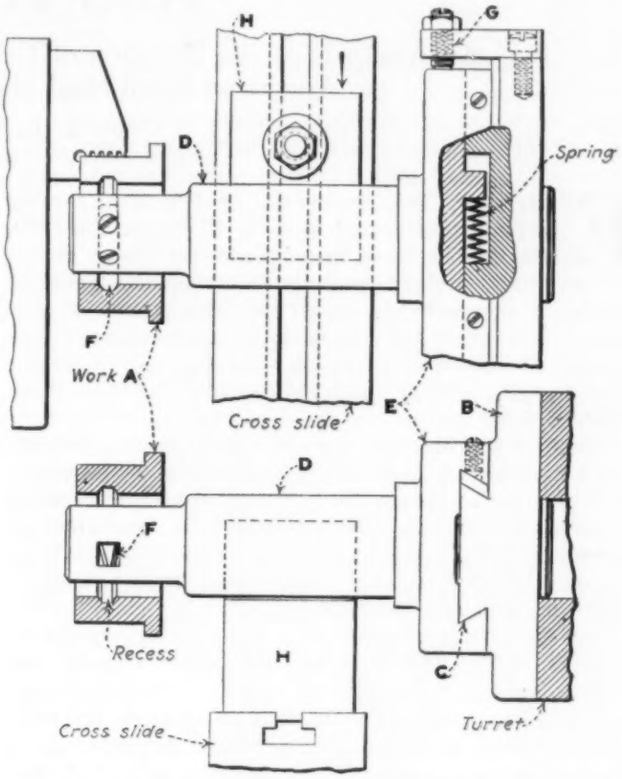
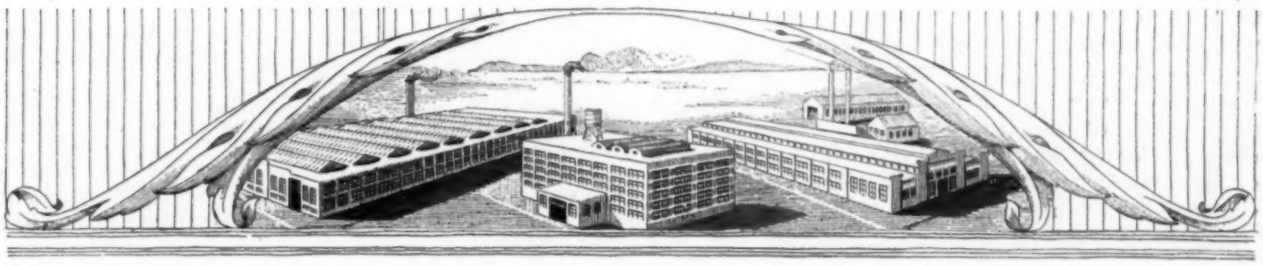


FIG. 323. RECESSING TOOL OPERATED BY CROSS-SLIDE

be made so that the bar will clear the work when passing in and out of the hole. The bar extends a considerable distance from the face of the turret, and would undoubtedly "chatter" if unsupported. Therefore a special block *H* is placed on the rear of the cross-slide, as indicated. This block is cut out in L-shape and on it the bar is supported. The operator brings up the turret and enters the tool ready for work, the correct distance from the face being determined by the turret stops. The cross-slide is then moved in the direction of the arrow until the bar rests on the block, after which slow hand feed is used to force the tool in to the correct depth. A stiff coil spring between the fixed member and the slide causes the latter to recede after the recess has been cut and the pressure removed.

An opportunity is often found for using a tool of this kind, particularly when it is desirable to use the cross-slide in connection with other turret tools. It is possible to design it in such a way that tools may be used at both front and rear slides, although the method of support may be slightly different from that shown, depending on the work.



The Open Price Association and the Sherman Anti-Trust Act

An Analysis of the Decision of the Supreme Court in the Case of the American Hardwood Manufacturers' Association

By A. H. STOCKDER
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EVER since the enactment of the now famous Sherman Anti-Trust Act by Congress, in 1890, American business men have sought some means whereby they might lawfully combine in order to eliminate or moderate what, to their mind, is the undesirable effect of unrestricted competition. The records of court decisions under the Sherman Act show that these efforts at combination have followed three distinct lines.

The first was based on the exercise of control through the ownership of plant and equipment or of the securities of other concerns. This line of procedure resulted in such combinations as the Standard Oil trust, the old American Tobacco Co. and other combines that were in restraint of interstate commerce, though not necessarily monopolistic in character.

The second line of approach was based on contractual arrangements between seller and buyer whereby the seller sought to retain control over the commodity until it reached the ultimate consumer, all through the ordinary channels of trade. The Sherman Act was felt to be inadequate to cover all of these practices and was, in 1914, strengthened through the passage of the Clayton Act and the Federal Trade Commission Act, directed particularly against unfair trade practices.

The third plan was based upon the formation of trade federations, commonly known as "pools," whereby the combining business establishments create some central administrative organization, vested with more or less disciplinary power, to carry out their purposes. And now, through the recent decision handed down by the United States Supreme Court, October Term, 1921, in the case of the American Column and Lumber Co., et al, Appellants vs. United States, the "open price association" has been added to the list of devices more or less specifically under the ban of the courts.

Co-operative Competition

The open price association is an institution devised by a Chicago attorney, the late A. J. Eddy, to put into effect what he chose to call "co-operative competition." In a book entitled "The New Competition," published in 1909, he goes into minute detail as to the operation of his plan. This book, through the tireless efforts of its author, became the keystone of the arch of a vast business system that soon found favor with men engaged in practically every important industry.

After attacking competition largely from its more sordid side — the so-called "cutthroat competition" which aims to ruin or drive out weaker competitors in the field, Mr. Eddy set forth his plan for substituting co-operative competition in its place. He had made a careful study of all court decisions interpreting the various anti-trust laws and had come to the conclusion that an association which avoided the exercise of a coercive discipline upon its members did not constitute a violation of the Sherman Law. The next step was to devise some method of inducing the members of such an association to accept a given range of prices as standards without committing themselves to adhere to them either through an actual or an implied agreement. To accomplish this, Mr. Eddy developed the "open price" idea.

The "open price," as defined by its inventor, is "a price that is open and above board, that is known both to competitors and customers, that is marked wherever practicable in plain figures on every article produced, that is accurately printed in every price list issued—a price about which there is no secrecy, no evasion, no preferences."

How this price is to be used is set forth as follows:

(1) When men meet and each says, "My price is so-and-so," and all say the same, a promise to maintain that price may, perhaps, be inferred from subsequent events; but no such promise can be inferred from frank statements of past transactions; and yet more in the way of stability of prices will result from the mere interchange of information than from an agreement to maintain prices. Knowledge regarding bids and prices actually made is all that is necessary to keep prices at reasonably stable and normal levels. No agreements to maintain prices are necessary.

(2) Do nothing you are afraid to record; record everything you do, and keep your records where any public official in the performance of his duties may have easy access to them. In short, preserve so carefully all evidence regarding intentions, acts and results that there will be no room for inference or argument that anything else was intended, done or achieved.

The recent decision of the Supreme Court gives a picture of the machinery employed to reduce competition through the medium of the "open price." This machinery, which is referred to in the decision as the "paper plan," is characterized by the court as "a system of co-operation among the members, and consists of the interchange of reports of sales, prices, production and practices, and in meetings of the members for discussion for the avowed purpose of substituting 'co-operative competition' for 'cutthroat competition,' of keeping 'prices at reasonably stable and normal levels,' and of improving the 'human relations' among the members." A detailed outline of the plan follows:

First: Each member to make six reports to the secretary, viz :

(1) A daily report of all sales actually made, with the name and address of the purchaser, the kind, grade and quality of lumber sold and all special agreements of every kind, verbal or written, with respect thereto. The reports to be exact copies of orders taken.

(2) A daily shipping report, with exact copies of the invoices, all special agreements as to terms, grade, etc. The classification shall be the same as with sales.

(3) A monthly production report, showing the production of the member reporting during the previous month, with the grades and thickness classified as prescribed.

(4) A monthly stock report by each member, showing the stock on hand on the first day of the month, sold and unsold, green and dry, with the total of each kind, grade and thickness.

(5) Price-lists: Members must file at the beginning of each month price-lists showing prices f.o.b. shipping point, which shall be stated. New prices must be filed with the association as soon as made.

(6) Inspection reports: These reports are to be made to the association by a service of its own, established for the purpose of checking up grades of the various members and the plan provides for a chief inspector and sufficient assistants to inspect the stocks of all members from time to time.

Second: The secretary is required to send to each member:

(1) A monthly summary showing the production of each member for the previous month, "sub-divided as to grade, kind, thickness, etc."

(2) A weekly report, not later than Saturday, of all sales, to and including the preceding Tuesday, giving each sale and the price, and the name of the purchaser.

(3) On Tuesday of each week the secretary must send to each member a report of each shipment by each member, complete up to the evening of the preceding Thursday.

(4) He must send a monthly report, showing the individual stock on hand of each member and a summary of all stocks, green and dry, sold and unsold. This report is very aptly referred to by the managing statistician as a monthly inventory of the stock of each member.

(5) Not later than the tenth of each month the secretary shall send a summary of the price-lists furnished by members, showing the prices asked by each, and any changes made therein must be immediately transmitted to all the members.

(6) A market report letter shall be sent to each member of the association (whether participating in the plan or not) pointing out changes in conditions both in the producing and consuming sections, giving a comparison of production and sales and in general an analysis of the market conditions.

Third: Meetings shall be held once a month at Cincinnati or at points to be agreed upon by the members. It is intended that the regular meetings shall afford opportunity for the discussion of all subjects of interest to the members.

Plan in Practice

The Supreme Court does not appear to have considered the "Plan," as such, a violation of the anti-trust laws, but to have looked to the purpose desired to be accomplished through it. The court, in its decision, went into some detail to indicate that this plan was not closely adhered to in practice with the obvious intent of making its purpose more easily attainable. Thus, it is brought out that "three important additions" were made to the plan.

In the first place, instead of holding one meeting per month, as provided for, the association met approximately once each week for over forty weeks in the Southwestern territory.

In the second place, before each of these meetings a questionnaire was sent out to the members, and from the replies received, supplementing the other reports, the statistician compiled an estimate of the condition of the market, actual and prospective, which was distributed to the members attending each meeting, and was mailed to those not present. There were eleven questions on this list of which the most important were:

(4) What was your total production of hardwood during the last month? What do you estimate your production will probably be for the next two months?

(10) Do you expect to shut down within the next few months on account of shortage of logs or for any other reason? If so, please state how long you will be idle.

(11) What is your view of market conditions for the next few months and what is the general outlook for business? State the reasons for your conclusion.

The plan on paper provided only for reports of past transactions and much is made of this in the record and in argument—that reporting to one another past transactions cannot fix prices for the future. But each of these three questions plainly invited an estimate and discussion of future market conditions by each member, and a co-ordination of them by an expert analyst could readily evolve an attractive basis for co-operative, even if unexpressed, harmony with respect to future prices.

In the third place, the court pointed out that the plan provided for a monthly market report letter to go to all members of the association. In practice this market report letter was prepared by F. R. Gadd, manager of statistics, but his review of the market and forecast for the future were contained, almost from the beginning, not only in these market letters but also in the weekly sales reports, so that they were sent out to all of the members nineteen times between Feb. 1 and Dec. 6, 1919, and they were discussed at all but one or two of the forty-nine meetings which were held. All the activities of the plan plainly culminated in the counsels contained in these letters and reports.

Price Maintenance

In addition to these three points of departure, the court showed that the plan resulted in the maintenance of high prices in the face of a falling market. This is illustrated by excerpts from letters of members to the secretary which are contained in the court's opinion. One member says: "All who have access to your report bring their prices to the top." Another: "There seems to be a friendly rivalry among members to see who can get the best prices, whereas under the old plan it was cutthroat competition." Still another says: "Since we became members we have been selling our lumber at several dollars per thousand more than formerly and we are perfectly satisfied with the plan."

In the opinion of the court, given by Justice Clarke, the open price association is a combination or conspiracy in restraint of trade and, as such, a violation of the Sherman Anti-Trust Act. The court says "The plan is, essentially, simply an expression of the gentlemen's agreement of former days, skillfully devised to evade the law. To call it open competition because the meetings were nominally open to the public, or because some voluminous reports were transmitted to the Department of Justice, or because no specific agreement to restrict trade or fix prices is proved, cannot conceal the fact that the fundamental purpose of the plan was to procure harmonious individual action among a large number of naturally competing dealers with respect to the volume of production and prices, without having any specific agreement with respect to them, and to rely for maintenance of concerted action in both respects, not upon fines or forfeitures, as in earlier days, but upon what experience has shown to be the more potent and dependable restraints, of business honor and social penalties—cautiously reinforced by many and elaborate reports, which would promptly expose to his associates any disposition in any member to deviate from the tacit understanding that all were to act together under the subtle direction of a single interpreter of their common purpose, as evidenced in the minute reports of what they had done and in their expressed purposes as to what they intended to do.

The court, however, seemed to imply that it might make some difference if the reports were sent out to

both sellers and buyers and were free from analyses by a skillful interpreter of data in such a way as to recommend harmony of action, for it goes on to say: "In the presence of this record it is futile to argue that the purpose of the plan was simply to furnish those engaged in this industry, with widely scattered units, the equivalent of such information as is contained in the newspapers and government publications with respect to the market for commodities sold on boards of trade or stock exchanges. One distinguishing and sufficient difference is that the published reports go to both seller and buyer, but these reports go to the seller only; and another is that there is no skilled interpreter of the published reports, such as we have in this case, to insistently recommend harmony of action likely to prove profitable in proportion as it is unitedly pursued."

Dissenting Opinions of Justices

The decision of the Supreme Court, cited here, was not, however, unanimous. Three justices, Holmes, McKenna and Brandeis, dissented. As affecting the practical situation this of itself means little. Nevertheless, the opinions of these eminent jurists merit consideration.

Justice Holmes says: "A combination to get and distribute such knowledge, notwithstanding its tendency to equalize, not necessarily to raise, prices, is far from a combination in unreasonable restraint of trade. It is true that it is a combination of sellers only, but the knowledge acquired is not secret, it is public, and the buyers, I think I may assume, are not less active in their efforts to know the facts. A combination in unreasonable restraint of trade imports an attempt to over-ride normal market conditions." This, it is evident, is an application of the rule of reason which was first applied to anti-trust cases during the presidency of Theodore Roosevelt.

Justice Brandeis and McKenna hold that the Government has failed to prove that coercion was used to maintain prices or to restrict production. In their opinion, "The illegality of a combination under the Sherman Law lies not in its effect upon the price level, but in the coercion thereby effected. It is the limitation of freedom, by agreements which narrow the market or by the coercive power of rebates which constitutes the unlawful restraint."

They look upon the collection and dissemination of information pertaining to prices, sales, stocks on hand, etc., as an exercise of the constitutional right of free speech.

Furthermore, they cannot reconcile the opinion of the court in declaring illegal a combination of this type, comprised of about 5 per cent of all hardwood manufacturers who produce about 30 per cent of the total annual production, with other opinions which gave a clean bill of health to the United States Steel Corporation controlling 50 per cent of the country's steel industry, and to the United Shoe Machinery Co. which enjoys a practical monopoly of the production of shoe manufacturing machinery. And Justice Holmes concurs with them on these points.

An analysis of the decision of the Supreme Court in this case leaves no doubt as to the illegality of such open-price associations as gather data on prices, sales, stock on hand and market conditions and use this information as described above. There remains but to point out the probable effect that this decision will have upon the organization and conduct of business.

In the first place, the court appears to suggest that it might make some difference if the data were sent to both sellers and buyers, provided, however, that such information be kept free from recommendations seeking to bring about a uniformity of action to control or influence prices. If this assumption is correct, it would still be feasible to continue the open-price associations now in existence. However, certain radical changes would have to be made in their method of operation. But these changes would probably not have to be as radical as those exacted by Samuel Untermeyer of the price associations in the building industry, which according to reports, were required to pledge themselves to cease gathering statistics of prices, and similar data, to escape prosecution as combinations in restraint of trade. Under the court's decision the mere act of gathering information does not of itself seem to constitute a violation of the law. The purpose to which the information is put is the significant point.

How Far May Open Price Associations Go?

The Federal Trade Commission will probably be called upon to define how far open-price associations may go in carrying out the purposes set forth in their "paper plans" to be within the law. It is to be hoped that the members of such associations will find it possible to continue their organizations for the sake of the benefit that the industries affected will derive therefrom. Stability in industry is desirable. Wasteful cutthroat competition, the aim of which is to destroy competitors, is undesirable from the general economic standpoint. In the long run goods will not be produced to be sold at a price which does not cover the costs of production and marketing plus a normal return on the capital involved. If these associations should concentrate their efforts upon the problem of securing better methods of production with a view to reducing wastes, instead of attempting to maintain high prices to cover these wastes, the results might be highly gratifying.

In the second place, to maintain a healthy condition in industry demands a more complete knowledge of production, stocks on hand, movement of goods, and prices, than has heretofore been generally available to the business public as well as to the consumer. There is an opportunity for this phase of the activities of open-price associations to be taken up by independent statistical service bureaus that supply a regular information service to one or more industries. It will probably also stimulate the Department of Commerce to greater activity along these lines.

In the third place, greater activity in the formation of combinations through the medium of the holding corporation may be anticipated. If a corporation, such as the United States Steel Corporation, which controls about one hundred and fifty subsidiaries and through them about 50 per cent of the steel industry of the country, is within the law, many of these open-price associations whose members control a much smaller share of their respective industries might well assume the holding company form of organization and be on the safe side. Of course, it must be borne in mind that, because of practical difficulties of an economic nature, this form of combination is not suited to some of the industries that now maintain open-price associations. Nevertheless, there are many industries in which the movement toward combination will be stimulated as a result of the decision of the Supreme Court in this case.

Methods and Operations in a Filter Plant

The Construction of Filters—Some Interesting Machine Operations—Standards for Limits for Drive, Tight, Keyed and Running Fits

By FRANK A. STANLEY

THE illustrations in the accompanying article show some of the tools and methods used in the Oakland shops of the Oliver Continuous Filter Co., San Francisco, Cal. The continuous filters manufactured by this company were originally developed for the filtration of slime in cyanide plants. They have

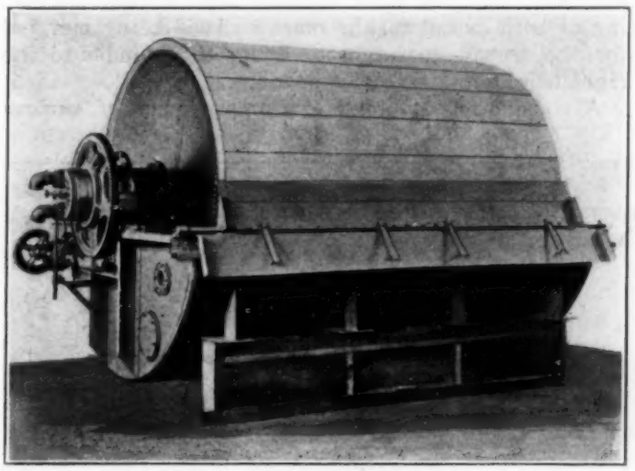


FIG. 1. CONTINUOUS FILTER

since been extended rapidly to the chemical and industrial fields. They are applied to dewatering concentrate as produced by the oil flotation process; and in the chemical industry they are used in the manufacture of paints, dyes, caustic alkalis, nitrate of soda, phosphates, and many other chemical precipitates. Newer applications are in the manufacture of starch and glucose, and in the sugar industry they are used for the filtration of saturated lime in beet sugar factories and are further applied to the purposes of cane sugar refineries. These are a few of the lines of manufacture in which this make of filter is employed.

One of the many types of filters built by this company is illustrated by Fig. 1. Without going too fully into details of design and construction, some interesting principles may be briefly pointed out in order that the shop operations on certain members may be more readily understood.

This continuous filter consists of a cylinder or drum which in operation revolves partly submerged in an open tank containing the material to be filtered. The drum surface is divided into shallow compartments supported underneath by a screen and protected by wire winding to prevent wear. Each section of the cylinder is provided with a pipe connection, which passes through a hollow trunnion to a valve which is automatic in its action. This controls the vacuum application for forming and washing the cake, and also controls the admission of air for the discharge of the cake and for the cleansing of the filter medium. A scraper fits across the tank in such a manner that the cake can be entirely removed after it has been released by air.

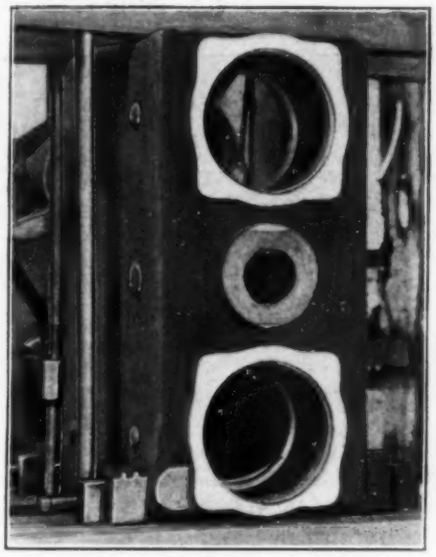


FIG. 4. PUMP CYLINDER IN PLACE FOR BORING

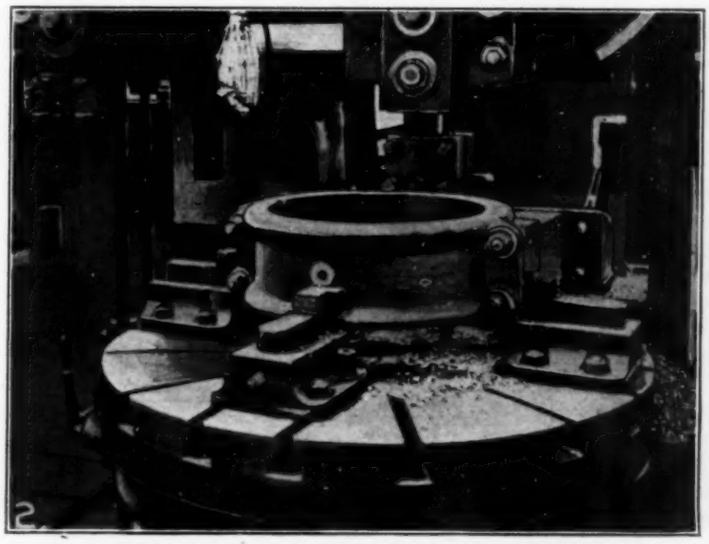


FIG. 2. BORING A TRUNNION BEARING IN THE VERTICAL MILL.

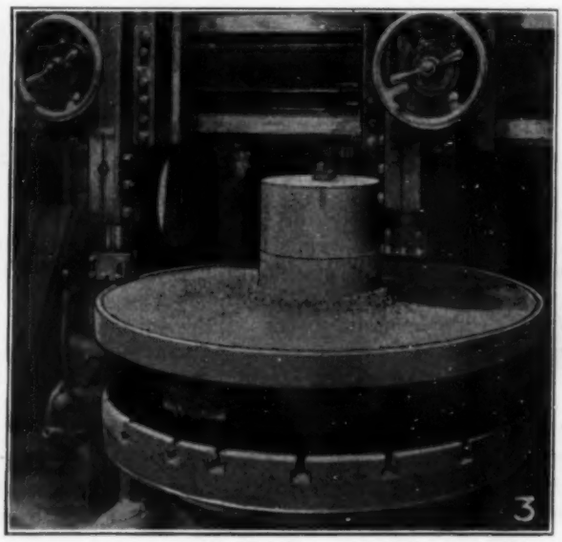


FIG. 3. TURNING A BEARING IN THE VERTICAL MILL

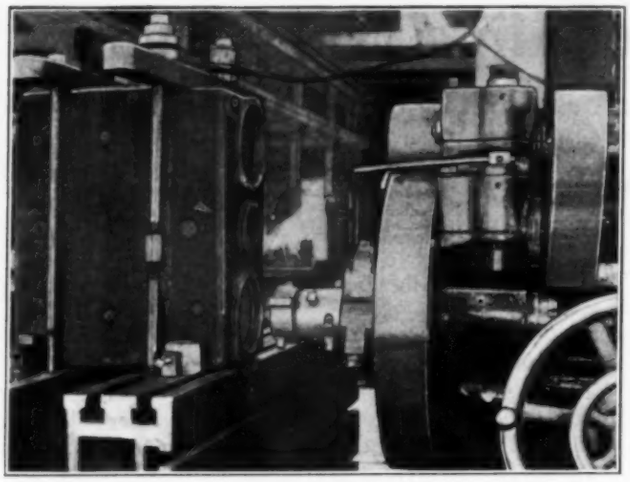
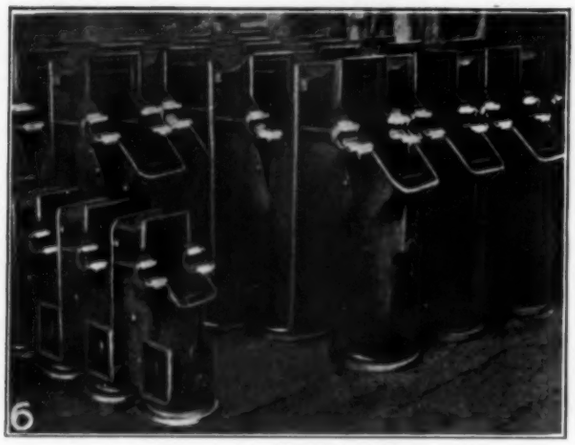


FIG. 5. PUMP CYLINDER

boring machine are presented in Figs. 4 and 5. The first of these photographs is reproduced to show the character of the opening to be bored out, and the shoulder and flange surfaces to be machined. This also illustrates clearly the method of securing the casting upon the work table by means of stop screws at the sides and long heavy straps drawn down by square-head bolts from the table T-slots. In Fig. 5 the work is seen more from the side where the boring head is shown in position for entering the lower of the two cylinder openings. This boring head is made up with inserted cutters for roughing and finishing the bore and for surfacing the joint face outside the casting, as well as for cutting the shoulders and counterbored seats around the chamber. The work remains fixed during the boring of both cylinders, the machine head being elevated for the second operation to bring the spindle to the right height for the upper opening.

A considerable number of pump frames of various



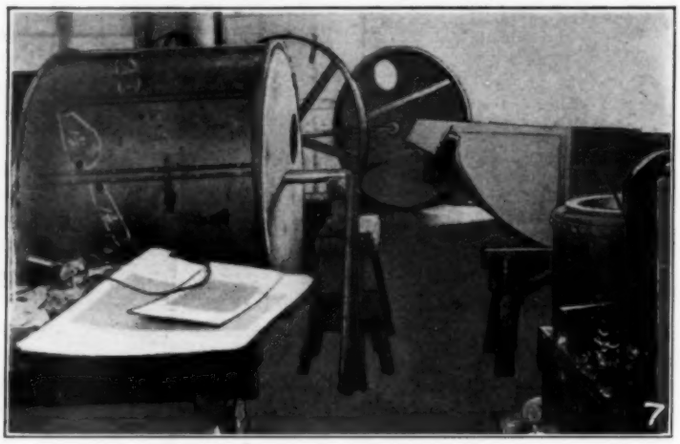


FIG. 6. PUMP FRAMES. FIG. 7. CORNER OF ERECTING DEPARTMENT

Both horizontal and vertical boring mills are used for various classes of work in the production of these filters. There are pump cylinders to be bored, trunnion bearings to be bored out, trunnions to be machined externally and numerous other members where boring and turning operations are carried on advantageously. In Fig. 2 a typical operation is illustrated; the boring of a big trunnion bearing which, when finished, will be mounted at one end of the continuous filter to carry the trunnion, through which are connected the series of pipes which lead from the various drum sections to the automatic valve referred to above. The method of boring this trunnion bearing is shown clearly in the illustration, where it is seen held between the jaws on the table of a vertical boring mill. The bearing proper and the cap have already been planed and fitted across the joint surfaces, the stud holes drilled and tapped, the studs put in place, and the cap firmly secured in position by the nuts on the studs. The assembled bearing is then brought to the boring mill where it is set up square and gripped in the jaws for the boring of the hole to the necessary diameter.

In Fig. 3 is shown the operation of turning a big hub or trunnion on the vertical boring mill with the flanged head of the work seated over the table jaws and held internally by these jaws, while turning is accomplished with a tool carried in one of the regular boring mill heads.

Two views of a pump cylinder casting on a horizontal

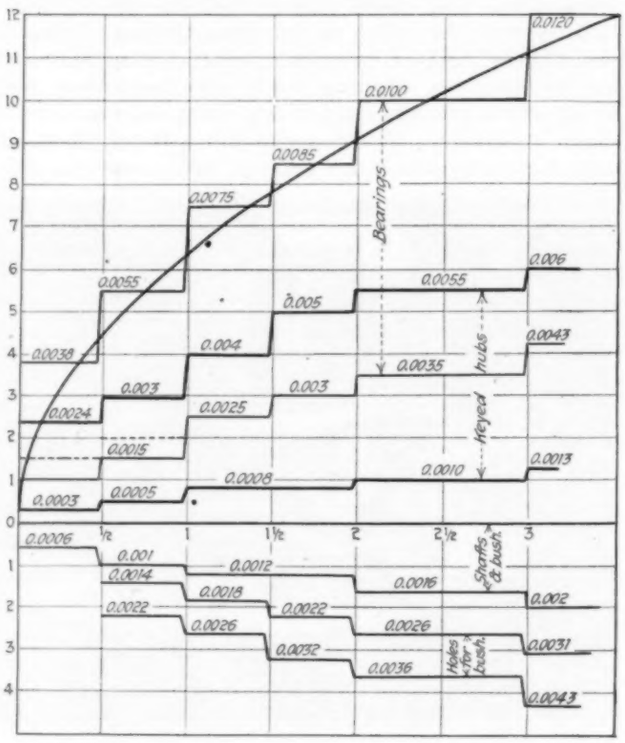


FIG. 8. CHART OF LIMITS AND TOLERANCES

kinds are shown in the group illustrated by Fig. 6. These castings are bored out for the cylinders on a lathe by means of special attachments in the form of a big boring bar, which is mounted in supporting brackets on the carriage of the lathe and fed along to carry the cutters through the work. The drilling of the bolt and stud holes around the flanges and for the shaft caps is accomplished in special jigs under upright and radial drills. The main jig takes care of practically all the holes in the casting except those located at an angle for the cap bearing studs. For the drilling of these stud holes the pump base is mounted at an angle under the drill press to bring the surface to be drilled into correct position horizontally.

The filters are made in a wide range of sizes which add much to the interest of the work going through the plant. For example, the sizes most commonly used range from a diameter of 3 ft., a length of 6 in., and an area of 4 square feet up to a diameter of 14 ft., a length of 24 ft. and an area of 1,056 sq.ft. The drums or cylinders and tanks, particularly for the larger sizes, constitute some striking examples of big work on sheet metal and other parts. One view is here reproduced in Fig. 7, showing a corner in the department where different sizes of filter parts are undergoing the erecting process.

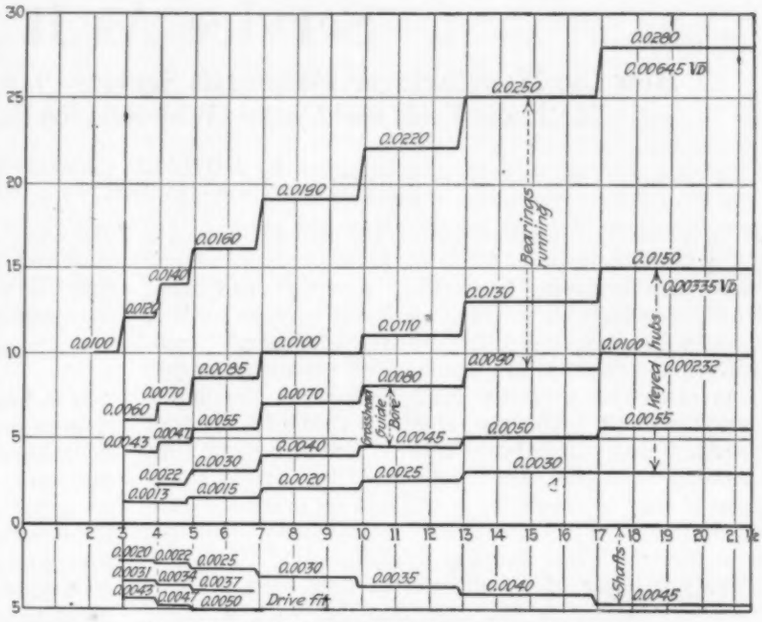


FIG. 9. CHART OF LIMITS AND TOLERANCES

Shop Allowances

This plant has done some most progressive work in establishing definite limits and tolerances for all classes and all sizes of fits on the various parts produced. The two charts in Figs. 8 and 9 show the high and low limits for drive, tight, keyed and running fits. Fig. 8 shows sizes up to 3 in.; Fig. 9 carries the diameters up to 21½ in. The latter diagram includes also the diameters of crosshead guide bores.

In explanation of the charts it may be pointed out that the nominal diameters of the shafts and bores will be found on the horizontal line extending across the sheet and marked with divisions ½, 1, 1½, 2, 2½, 3 in Fig. 8; and 3 to 21½ in Fig. 9. The vertical lines at the right and left of the charts marked respectively 0, 1, 2, 3, and 0, 5, 10, 15, etc., represent allowances in thousandths of an inch. For example referring to Fig. 8, taking a 2-in. diameter on the horizontal line, we find that keyed hubs, say, are bored 2.0055 to 2.0010 in. For the same size the shaft is held between 2 and 1.9984 inches.

Special Reaming Fixture for Main Bearings

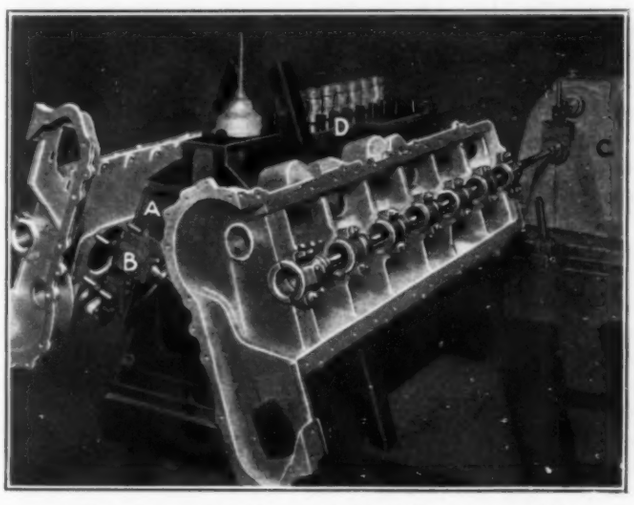
Special Correspondence

Instead of scraping and fitting the motor crankshaft bearings by hand the Franklin Motor Co. believes in modern machining methods which consist of very careful boring and line reaming, followed by the Martell system of reaming. The seven bearings for the crankshaft make it quite a problem to secure the desired accuracy in a commercial scale of production and at a reasonable cost.

Two crankcases are bolted to the stand *A*, being held down in position by hook bolts and the easily handled spoked nuts as at *B*. An electric motor enclosed in the head *C* drives the reamer through suitable reduction gears. Some of the reamers are shown at *D*.

As is common with most high-grade motors, selective assembly is used within comparatively narrow limits. Each bearing of the crankshaft is carefully measured and its diameter noted. When all the bearings have been measured, a reamer is selected for each bearing which will give just the desired allowance for an oil film.

These reamers are put on the reamer bar in their proper sequence and the crankcase reamed as shown in the illustration. This method allows just the right clearance for oil in each bearing, eliminates the unsatisfactory scraping operation and secures a uniformity of motor bearing conditions which insures satisfactory service to the user.



SPECIAL FIXTURE FOR DRIVING MARTELL REAMER

By using the double stand shown one man can be selecting the reamers for the next crankcase while the first is being reamed, thus securing double work from one reaming head and materially increasing the output per square foot of floor space.

Service As It Isn't

How the Manufacturer Makes His Service Plant Efficient—Variety of Repair Methods, Tools and Costs—Why Service Reputation Influences Sales

BY HOWARD CAMPBELL
Western Editor, AMERICAN MACHINIST

ONE of the peculiarities of the American people is their knack of isolating some one word of our fast-developing "American" language, and using it for every legitimate and illegitimate purpose until it is worn to a frazzle. The words "efficiency," "camouflage" and "sell" afford examples of what may happen to an otherwise perfectly good word when the public fastens onto it. This is especially true of the word "service," which has always covered a multitude of sins, becoming more and more indefinite, and unless something is done to rescue it, it will lose its original meaning and some other word must be provided to fill the place for which this one was intended.

The purchaser of an automotive unit buys his car, truck or tractor, as the case may be, with a vague understanding that his purchase entitles him to something known as service. In an effort to make this service effective, the various manufacturers have organized service departments, which most of them regard as a necessary evil—and with most of them, that is as far as their interest goes. It is true that some manufacturers have their own distributing stations where the customers are to come for the necessary repairs. Such manufacturers usually have at least one man in the repair shop who has been through the factory "service school," such as it is, and is presumably capable of doing any job required, in what is supposed to be a standardized manner.

LACK OF EQUIPMENT HINDERS WORK

But even then, the chances are that he has to do the work with tools that either he or the service manager has devised, with the result that the job may be done correctly—that is to say, in approximately the condition in which it was turned out of the factory, and in a reasonable length of time, or it may not. I understand that the manufacturers of what is probably the most popular car in the world require only that the dealer or service station manager purchase his parts from the factory, and that he keep his prices within a certain limit, in order to obtain the right to use a sign which reads "AUTHORIZED SERVICE STATION." So far as I have been able to learn, all that is authorized are the parts that he uses. He may use any kind of machinery he likes, or any kind of tools he has or may devise, and may turn out the work in any length of time he requires. Of course, the price factor limits the time to a certain extent, but it has nothing to do with the quality, and so far as I can learn, this is the only automobile manufacturing firm in existence that attempts to regulate the prices charged.

It should be obvious to even the most casual observer that a job done with poor tools is going to take a far longer time than the same job done with tools designed for that express purpose. Not only that, but a job done with poor tools is often a poor job. So under the present system, where each service station manager or garage foreman buys just such tools as he has to have and can't make, and makes all the rest out of such materials as he happens to have at hand, it is obvious that "service," as exemplified by a dozen different service stations, means a dozen different things.

Read before Chicago meeting of S. A. E., Feb. 1, 1921.

LONG ISLAND SERVICE EFFICIENCY

I do not think there is any question but that the largest automotive service stations in the world are on Long Island, New York. Long Island City is just across the river, only a few minutes from "automobile row" on upper Broadway, easily accessible and yet out of the crowded section. The Packard Motor Car Co. has a six-story service plant there, the Pierce-Arrow Co. maintains a plant there, as do the White Motor Co., the Rolls-Royce Co., and several others, including the Hellman Motor Co. which is a Ford "authorized service station."

Here, also, the New York Telephone Co. has its own service plant, by far the most complete of them all. This company owns more than a thousand motor cars and trucks, including nearly 700 Fords, practically all of which are kept busy ironing out the troubles in the communication system of New York City and vicinity.

Last summer I spent some time in each of these several service plants gathering material for a series of articles since published in AMERICAN MACHINIST, and had an opportunity to observe the manner in which different organizations went about the job of repairing motor cars and trucks. I discovered, among other things, that not only did these different service managers employ different tools and methods for performing approximately the same operation, but that different kinds of tools and methods were employed for performing the same repair operation on the same kind of car or truck.

Five different service plants had five different methods of align-reaming the main bearings. They all had different ideas and tools for reaming and facing connecting rods, and one plant had two types of fixtures for performing this operation. Practically all these pieces of equipment were designed by the shop foreman or superintendent and were made in their own shops. One plant uses an electric hoist on an overhead trolley to lift the motor from the chassis; another uses a chain hoist, and another uses a floor crane which operates with a crank.

For re-boring the cylinder blocks, one plant uses a certain type of reamer, another uses a different kind, still another uses a patent cylinder re-boring tool, while yet another grinds the bores. The chances are that four car-owners will pay four widely different prices for having approximately the same type of job done.

The New York Telephone Co. is one firm that does not hesitate to make any equipment necessary to keep its cars and trucks in operation. It is servicing its own units, which is considerably different from servicing that of a customer who will pay whatever the bill comes to with little, if any, protest. Consequently, the New York Telephone Co. has tools for removing bearing caps, for pulling out camshafts, for removing clutches from

their shafts, for removing drive shaft sleeves from Ford motors, for holding bearings while reaming, for compressing the packing in a rear bearing case, for testing magnets, and for doing all kinds of jobs, which, without special equipment, would require a great deal more time than the telephone company thinks necessary. It makes every piece of equipment, whether tool, jig, or templet, that is required to expedite repairs, and the service manager claims that enough is saved in a short time to pay for the tool many times over. Those of our factory service managers who are looking for ideas would undoubtedly find some good ones there.

Repair Ideas Not Distributed

Some years ago, the designers of a certain well-known make of car constructed a steering gear in which no provision was made for taking up the wear. It is possible that they were designing a car which was never to wear out, but unfortunately, their plans miscarried. In due time, numbers of these cars showed up at the Long Island service station for steering gear repairs. So some one there devised a method of repairing this part which made it practically as good as new and also made possible take-up for wear. But do you suppose that any of the others of this company's service plants know how to do this? I doubt if the home plant ever heard of the idea.

Let us suppose, then, that a man owning one of these cars was to take it into the Long Island service station to have the play in the steering gear taken up. He would have his car back in a comparatively short time, would pay a reasonable price for the job, and would probably feel perfectly satisfied. But suppose another man who owned the same type of car took his car into the Detroit or Chicago service plant for a similar purpose. The chances are that he would either have to buy a new steering gear, or would get a job that would wear loose again in a short time.

The foreman in the machine shop of the Long Island service plant of another well-known company has devised a method of testing valve-springs, so that he knows that every spring used is of the proper tension. The fact that he finds some weak ones is proof that such an operation is necessary. But do you suppose that the rest of this company's distributors have similar testing devices? I doubt it very much.

The same foreman invented a gage for testing the grinding of valve heads. The gage is bell-shaped, with a hole down through the handle for the valve stem, and with the inside of the bell ground to the exact angle that the valve seat was intended to have. The gage is, of course, hardened and ground. The operator grinds the angle of the valve until he has a seat, then he puts a bit of Prussian blue in the bell of the gage and rubs it around. Then he inserts the valve and turns it around in the gage while the valve seat rubs against the blue. An examination of the seat will show whether the angle is perfect and whether the valve is seating all the way round or not. If the seat is not perfect, he changes the set-up of the machine until the desired results are obtained. Such accuracy as is obtained by this means would not be possible in the use of the ordinary bevel protractor such as the average machinist uses, and certainly the job would take much more time if the operator had to try the valves in a cylinder block. Why doesn't the company furnish each one of its service stations with one of these gages?

Contrast the methods in use in these service plants, which are supposed to be the best in the world, with the methods in use at the factories in which the cars were made. The Packard Motor Car Co., the Pierce-Arrow Motor Car Co., the Hudson Motor Car Co., the International Motor Truck Co.—practically all of the nine service plants that I visited—were operated by manufacturers who pride themselves that the methods in use in their factories are the best to be obtained or devised. Their manufacturing methods are standardized—their tools and gages are standardized—their inspection methods are standardized—everything in their shops that can be, is standardized, so that all parts will be alike and every car turned out will be exactly like every other one.

But when the man who has bought one of these cars needs some repair work done, what does he find? If he takes his car to one shop, he gets one kind of a job done and has the car back in three days, while it costs him, perhaps, $45. If he takes it to another shop, he gets it back in six hours, and they charge him $12. And the worst of it is that the shop where he got the poorer job and paid the more money may be the distributor's own service station.

It was told to me recently that a new manager was sent out to a certain Western city to take charge of a sales and service organization for the makers of a very prominent, high-grade car. After he had been on the job for some time, he discovered that the amount of service work done by his establishment was comparatively small. Upon looking up the records of owners in his district, he found that very few of them ever came near his place.

So he walked down the street, looking for a car of the brand that he was dispensing. He found one and immediately stationed himself where he could intercept the driver when he returned. The driver came along a few minutes later, and the distributor broached the subject of service and asked the driver where he had his repair work done. The man told him, and then the distributor asked, "Why don't you take your car to the local service station to get your work done?" The car owner said that there they didn't have any equipment to do a decent job with, consequently it took them three times as long as it should and when they finished it wasn't any good. So the dealer went back to his service station and looked it over. He found that the machine shop equipment consisted of two vises, one broken, a post drill, and an arbor press.

The time is coming when a sign "Authorized Service Station" will mean that the operators of that shop are using equipment approved by the manufacturers of the car whose name appears on the sign, that the work done will be done according to approved, and as far as possible, standardized, methods, and that the price charged will be standard except for such variations as are necessitated by the differences in overhead expense and wage scales in the different localities.

Then such a sign will mean that the factory is standing back of its service plants with a guaranty both as to quality and price. I predict that under those conditions, the automobile owner would no sooner turn his car over to an irresponsible mechanic who is operating a one-horse garage, than you would take your typewriter or dictaphone to a machine shop to have it repaired.

When that time comes, the word "Service" will have a definite meaning, both to the manufacturer and to the purchaser of the unit.

Bevel and Spiral Bevel Gear Practice

Standard Tooth Design for Straight and Spiral-Tooth Bevel Gears as Recommended by a Committee of the American Gear Manufacturers Association

BY FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE American Gear Manufacturers Association is endeavoring to determine standards that shall be of real value both to the users of gears and to those who manufacture them. With this in view it issues from time to time standards of recommended practice, and will appreciate suggestions, constructive criticisms and recommendations of all kinds. These should be sent to the office of the secretary, 4401 Germantown Ave., Phila., Pa. Users of gears should co-operate in every way possible. The practice recommended herewith was adopted in April, 1921. If anyone has suggestions or improvements to offer, now is the time to do so.

It is the aim to standardize on the tooth design of

Table I. Maximum Theoretical Addendum of Bevel Gear Pinion Back Cone Radius = 1 In.

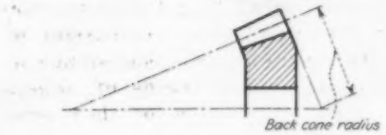
Ratio	14½ Deg.	20 Deg.	14½ Deg. Spiral	20 Deg. Spiral
1-1	0.0809"	0.1623"	0.1159"	0.2043"
2-1	0.0699"	0.1295"	0.0909"	0.1655"
3-1	0.0659"	0.1226"	0.0859"	0.1571"
4-1	0.0645"	0.1201"	0.0841"	0.1541"
5-1	0.0638"	0.1190"	0.0832"	0.1527"
6-1	0.0635"	0.1184"	0.0828"	0.1519"
7-1	0.0632"	0.1180"	0.0825"	0.1514"
8-1	0.0631"	0.1177"	0.0823"	0.1511"

Table II. Straight Bevel Gear Tooth Proportions
Pressure Angle 14½ Deg. Ratio 3-1 to 8-1
Tabular values are for 1 D.P. For any other pitch divide by diam. pitch used

No. of Teeth in Pinion	Addendum		Full Depth	Circular Thickness for Case-hardened Gears	
	Gear	Pinion		Gear	Pinion
14	0.560"	1.440"	2.157"	1.186"	1.955"
15	0.600"	1.400"	2.157"	1.221"	1.920"
16	0.640"	1.360"	2.157"	1.256"	1.885"
17	0.680"	1.320"	2.157"	1.291"	1.850"
18	0.720"	1.280"	2.157"	1.326"	1.815"
19	0.760"	1.240"	2.157"	1.361"	1.780"
20	0.800"	1.200"	2.157"	1.396"	1.745"
21	0.840"	1.160"	2.157"	1.431"	1.710"
22	0.880"	1.120"	2.157"	1.466"	1.675"
23	0.920"	1.080"	2.157"	1.501"	1.640"
24	0.960"	1.040"	2.157"	1.536"	1.605"
25	1.000"	1.000"	2.157"	1.571"	1.570"

Table III. Spiral Bevel Gear Tooth Proportions
Pressure Angle 14½ Deg. Ratio 3-1 to 8-1
Tabular values are for 1 D.P. For any other pitch divide by diam. pitch used

No. of Teeth in Pinion	Addendum		Dedendum		Full Depth	Circular Thickness for Case-hardened Gears	
	Gear	Pinion	Gear	Pinion		Gear	Pinion
10	0.500"	1.200"	1.420"	0.720"	1.920"	1.2000"	1.9416"
11	0.550"	1.150"	1.370"	0.770"	1.920"	1.2500"	1.8916"
12	0.600"	1.100"	1.320"	0.820"	1.920"	1.3000"	1.8416"
13	0.650"	1.050"	1.270"	0.870"	1.920"	1.3500"	1.7916"
14	0.700"	1.000"	1.220"	0.920"	1.920"	1.4000"	1.7416"
15	0.750"	0.950"	1.170"	0.970"	1.920"	1.4500"	1.6916"
16	0.800"	0.900"	1.120"	1.020"	1.920"	1.5000"	1.6416"
17 or over	0.850"	0.850"	1.070"	1.070"	1.920"	1.5500"	1.5946"



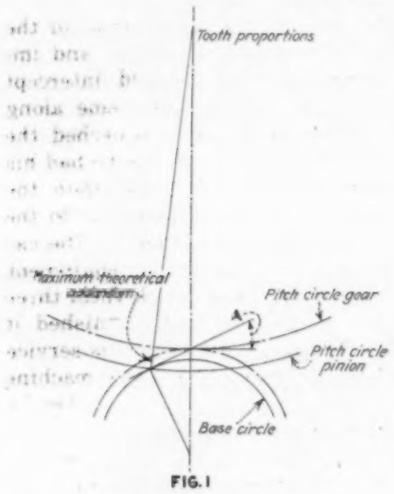


FIG. 1

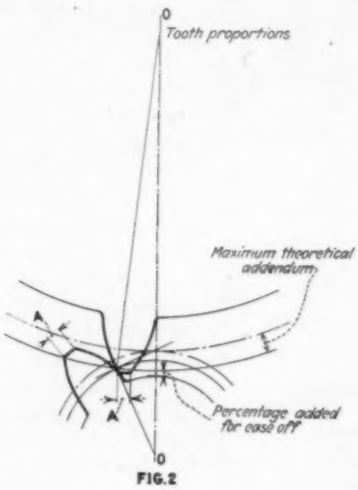
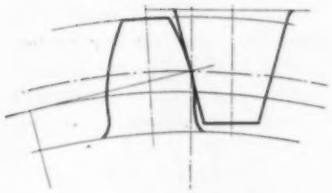


FIG. 2

	Gear	Pinion
Pitch depth	0.560"	1.440"
Full depth	2.157"	2.157"
Circ. thickness	1.186"	1.955"

Pressure angle 14½ deg.
14 Tooth Pinion Straight Bevel 3-1 Ratio or Greater

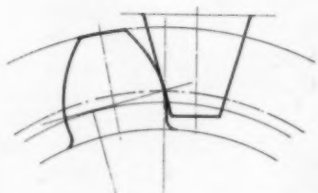
FIG. 3



	Gear	Pinion
Pitch depth	1.000"	1.000"
Full depth	2.157"	2.157"
Circ. thickness	1.571"	1.570"

Pressure angle 14½ deg.
25 Tooth Pinion Straight 3-1 Ratio or Greater

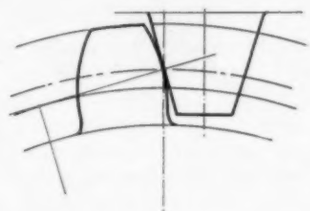
FIG. 4



	Gear	Pinion
Pitch depth	0.5000"	1.2000"
Full depth	1.9200"	1.9200"
Circ. thickness	1.2000"	1.9416"

Pressure angle 14½ deg.
10 Tooth Pinion Spiral 3-1 Ratio or Greater

FIG. 5



	Gear	Pinion
Pitch depth	0.8500"	0.8500"
Full depth	1.9200"	1.9200"
Circ. thickness	1.5500"	1.5946"

Pressure Angle 14½ deg.
17 Tooth Pinion Spiral 3-1 Ratio or Greater

FIG. 6

FIG. 1. MAXIMUM THEORETICAL ADDENDUM. FIG. 2. PERCENTAGE TO BE EASED OFF. FIG. 3. PROPORTIONS OF STRAIGHT TEETH. FIG. 4. STRAIGHT TOOTH PROPORTIONS. FIG. 5. SPECIMEN TOOTH SHAPES. FIG. 6. SPECIMEN TOOTH SHAPES

both bevel and spiral bevel gears and this first recommendation is for ratios between 3-1 and 8-1 for the 14½-deg. pressure angle with a detailed explanation of the steps taken to determine the recommended values.

Bevel gear teeth are considered as being on a pitch radius equal to the back cone radius of the particular gear or pinion. In Fig. 1, the pitch circles of the gear and pinion are drawn together at the base circle of the pinion determined by the pressure angle *A*. Involute tooth contact cannot take place below the base circle since the involute curve has its inception at the base circle and any projection of the gear or pinion beyond the base circle of the pinion at the beginning and end of the theoretical arc of action is useless in so far as the tooth action is concerned.

The problem is first to find the gear addendum, which at the beginning of the arc of approach extends to the base circle of the pinion, labeled in Fig. 1, the maximum theoretical addendum. The values in Table I were obtained on this basis by solving the oblique triangle for the various ratios and pressure angles. An examination of this table will show that the tabular values between ratios 3-1 and 8-1 do not change greatly and in preparing the bevel gear tooth proportion tables, we have assumed that there is no change.

A percentage has been added to the theoretical values, the purpose of which is to provide an ease-off. Reference to Fig. 2 will show graphically that unless this percentage is added the tooth load on the gear at the beginning of approach will lie along the very top edge of the tooth, a condition to be avoided.

The specimen shapes of the teeth specified in Table II of 14½-deg. straight tooth gear proportions are shown in Figs. 3 and 4. The circular thicknesses given in the table were obtained from these layouts by giving consideration not only to strength but also to the width of the top land and insure a width sufficient to prevent a complete carbonization with a consequent brittleness in case hardening.

The values given in Tables II and III are for 1 D.P. throughout. For any other pitch, it is necessary to divide the tabular values by the given diametral pitch.

For ratios below 3-1 it is purposed to provide additional tables. The range covered by these tables will necessarily be smaller than that covered by the present table as the change in the maximum theoretical addendum is more pronounced among the lower ratios as will be noted in an examination of Table I.

Spiral Bevel Gears

Table III shows the tooth proportions for 14½-deg. spiral bevel gears for ratios between 3-1 and 8-1. The values are obtained in the same manner as for the straight tooth gears with two modifications. The working depth of the spiral bevels is 85 per cent of that of straight tooth gears or approximate standard depth for the normal pitch. The bottom clearance is 0.07 of the circular pitch instead of the usual standard of 0.05 of the circular pitch.

Figs. 5 and 6 show specimen tooth shapes based on the proportions given in Table III. All tables shown cover only hardened gears.

A different proportion of circular thickness will be required for unhardened gear teeth. The 20-deg. pressure angle bevel and spiral bevel gears are under consideration and tooth proportion tables similar to those shown for the 14½-deg. will be offered in the near future.

The Bugaboo of Production Costs

By Harry Senior

From every side there is continually being dinned into our ears or flashed on our vision the command to "Cut Production Costs." Every advertiser of machinery seeks to impress upon our minds the idea that he can supply us with a machine that will "produce at lower cost," or a device that will "lessen the cost of production" to an extent that will pay the cost of installation in an incredibly short space of time. Emblazoned upon the bill-boards, embellished in the flood of gaudy advertising literature that reaches our desks, even staring us in the face from each alternate page top of American Machinist, is the constantly recurring admonition to "cut the cost of production."

In view of the fact our manufacturing costs are but about 10 per cent, in many cases even less, of our selling prices, is it not about time we began to talk about cutting something else? The best brains of the machine industry have been for years wrestling with the problems of developing new machinery or new methods of turning out more work in less time until it would seem that, instead of waiting to see if we are really going to get our shop work done for nothing, we might at least make the attempt to discover some way in which contributory costs can be made to follow the downward trend instead of continually going in the other direction.

The two most conspicuous items that may be classed as contributory cost are "overhead" and "selling expense." During the last twenty years, and with startlingly increased rapidity for the last five, these items have been mounting out of all proportion to production costs which, had until 1914 been going the other way.

Some few months ago I had occasion to call upon a concern having offices in a neighboring city with a view to purchasing additional equipment for our factory. I found upon arrival a splendid suite of offices with president, vice-president, works manager, and engineer, each installed in a sumptuously furnished private room surrounded with all the time and labor saving appliances for office use that there are on the market.

They had a good machine; just the thing I wanted and that "would cut my production costs enormously" (they all told me so), but the price was too high.

I expressed a desire to see the shop where the machine was made, thinking that I might perhaps find an example of how to do good work cheaply that would more than offset the cost of my trip to the city. This desire met with instant endorsement by the assembled officials and I was forthwith transported (in a high-powered car) to the outskirts of the city, where I found a little 7 x 9 factory, housing not more than ten people all told. Not even the Connecticut chap who, seeking a position as production manager, advertised his ability to "cut production costs 125 per cent," could have paid the rent on the downtown offices with this shop at anything like a fair selling price for the machine.

The "greedy worker" is often accused of getting more than his share of the profits of industry; but if 90 per cent of these profits go elsewhere than to the shop it would seem that he who works in a shop has at least a good alibi. If the published statements be true that the time-keeping mechanism of a high-grade watch costs the factory around 49 cents, or that the "works" of a tin Lizzie involve an expenditure of $69 (or is it 69 cents?), where would the dear consuming public get off if the shop man did his part of the work for fun?

Making Use of Tables

Some Quick Methods of Figuring—Using Tables of Squares and Cubes—Various Ways in Which Tables of Logarithms Can Be Used

By WILLIAM S. AYARS

MEN who do much computing use calculating machines or tables to a great extent. Those who do it only occasionally do not usually have these aids, and their work is not such that it would pay either them or their employers to purchase elaborate books of tables or expensive adding machines. The slide rule is quick and accurate enough when not more than three significant figures are wanted, and five or six place logarithms are both handy and quick when one is familiar with their use. But many men are called upon to do close figuring from time to time who do not own a slide rule and could not use one if they did; who have no access to either calculating machines or complete sets of tables.

Almost any handbook, however, has tables of squares from 1 to 999 and it is both easy and accurate to use such a table for multiplying together any two numbers whose mean or average is less than 1,000. The rule is as follows: Add the two numbers and divide by 2, thus getting the average; then take the square of the average from the table of squares, subtract the average from the large number and take the square of this number from the table of squares; subtract this latter square from the former and the difference is the product of the two numbers. For example: Find the product of 937×685:

$$\frac{937 + 685}{2} = 811;\ 811^2 = 657{,}721 \text{ (table)}$$
$$937 - 811 = 126;\ 126^2 = 15{,}876 \text{ (table)}$$
$$657{,}721 - 15{,}876 = 641{,}845$$

To use a table of squares for the square of a number beyond the range of the table. This is easy for any number not a prime number, especially if it be divisible by 2, 3, 5, 7, 11, etc. Divide the number by a factor that will make the quotient come under 1,000. Look up the square of the quotient and multiply it by the square of the factor, and the result is the square of the original number. To illustrate this, take the number 2,127. This will divide by 3, and the quotient $2{,}127 \div 3 = 709$. From the table,

$$709^2 = 502{,}681$$
$$3^2 = 9$$
$$9 \times 502{,}681 = 4{,}524{,}129, \text{ which is } 2{,}127^2.$$

It may be argued that some of these methods may take more time than doing the work direct. They will at first, but the advantage is that the number of multiplications is less, and therefore the chances of error are lessened. There are also cases where they do not apply easily, as where the mean between two numbers is fractional, thus

$$\frac{683 + 276}{2} = \frac{959}{2} = 474.5.$$

But the square of 474.5 is $\frac{1}{4}$ of the square of 2×474.5 or $\frac{959^2}{4}$.

Many tables of squares include square roots, but somtimes squares only are found. To use such a table to find square roots is easy, but care is needed. Take the number 374.544 whose square root is wanted. Now the number 374,544 is a perfect square—the square of 612. But 612 is certainly not the square root of 374.544 nor is 61.2 nor 6.12. You must work in *twos* each way from the decimal point. If we could find a square equal to 374, or 37,454, it could be used. We can find 37,249 and 37,636, the squares of 193 and 194 respectively. Now two places in the square is equal to one in the root; so if the square root of 37,249 is 193, the square root of 372.49 is 19.3 By simple interpolation, if needed, two more figures are *53* hence the square root of 374.544 is 19.353 to three places of decimals. This checks up with the actual calculation of $\sqrt{374.544}$.

Standard shafting sizes run $\frac{1}{16}$ under even quarter inches and tne writer once had to work out some problems on the strength of shafting. The task resolved itself into finding the proper size of standard shafting to carry a certain horsepower at a certain r.p.m. A very convenient formula is

$$\text{Horsepower of shafting} = \frac{d^3 f N}{321{,}000}$$

Here d is the diameter of shafting in inches; f is fiber stress allowed pound per square inch; and N = r.p.m. It was necessary to have the cubes of shafting diameters for quick work and on a rainy Sunday I worked them out for the common range of sizes. Take for example $3\frac{13}{16}$—what is its cube? I did it by changing $3\frac{13}{16}$ to the improper fraction 63-16. I took the cube of 63 and that of 16 from a table of cubes equal to: $63^3 = 250{,}047$; $16^3 = 4{,}096$. Then I used logs:

$$\log 250{,}047 = 5.398022$$
$$\log \quad 4{,}096 = 3.612360$$
$$\log x = \text{diff.} = 1.785662$$
$$x = 61.05, \text{ aprx.}, = (3\tfrac{13}{16})^3.$$

By a special table this is given as 61.04663. A value of 61 should have been close enough.

For finding a cube root when no table of cube roots is available, a table of cubes can be used in the same way as the table of squares previously explained. But here even more care is needed, because a move of one place in the root moves the decimal three places in the cube. Thus the cube of 12.1 is 1,771.561; of 121 it is 1,771,561. What then would be the approximate cube root of 17,715.61? We find in the table of cubes 17,779,581, the cube of 261. The cube of 26.1 would then be 17,779.581 which is quite close enough for most purposes. If it is necessary to compute a cube root, the easiest way is to look up the logarithm of the cube and divide it by 3. The result is the log of the root. This need not be very close for good results. It is always easy to get the log of a 4-figure number without interpolation. Take the number above, 17,715.61 call it 17,716.

$$\text{Log} \quad 17{,}710 = 4.248219$$
$$\text{Add for} \quad 6 = \quad 147$$
$$\text{Log} \quad 17{,}716 = 4.248366$$
$$\tfrac{1}{3} \log 17{,}716 = 1.416122;\ \text{antilog} = 26.07$$

This is quite close enough for all ordinary uses.

It is sometimes necessary in marine work to get the $\frac{2}{3}$ power of the displacement, the D^2 of the so-called

Admiralty Constant. It can be obtained by squaring the displacement in tons, and then taking the cube root of the square. Displacements usually run well over 1,000 tons, and have not the habit of coming out in easy figures. Thus take one of 4,725 tons. Its square is a big number and the cube root of that square none too easy to find. But it is very simple with logs:

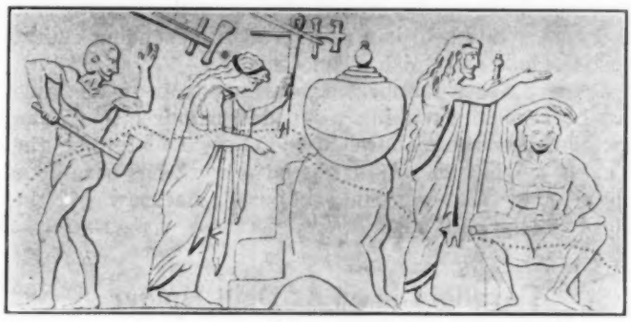
$$\text{Log } 4{,}725 = 3.674402$$
$$\times 2$$
$$\tfrac{2}{3} \text{ of it} = 3\overline{)7.348804}$$
$$2.449601$$
$$\log^{-1} 2.449601 = 281.6, \text{ aprx.}$$

Every bit of work necessary is shown as no interpolation was done. The log 0.449601 was not in the table, but the log of 281.6 is 0.449633 and that is close enough. The use of logarithms is simple and easy for any man who has a knowledge of arithmetic through fractions and decimals, and it has always been a surprise to the writer that so many men of intelligence are not only ignorant of their use, but look upon them as mysterious and impractical. Get any engineers' pocketbook and learn how to use them. The best explanation of them I have seen is in the cheap little pocketbook published by the I. C. S. of Scranton, called "Mechanics Pocket Memoranda."

Romances of Metal Working—The Myth of Hephaistos

By H. H. Manchester

BESIDES the more prosaic facts in the history of metal working which the writer included in previous articles on the evolution of the workshop, published in the American Machinist, there are many myths, traditions, romances, and personal anecdotes of metal working and metal workers which are even more interesting, if not so reliable, as the better authenticated history of



THETIS VISITS HEPHAISTOS' WORKSHOP

the subject. Such legends and stories are, moreover, of genuine importance, because in addition to their human interest, they disclose the atmosphere and conditions of the period to which they belong. Some of them are allegorical, while many of them are more likely a vivid coloring of historic facts. But even though it may be hard to tell how much of such tales is true and how much fancy, their fascination is proved by the fact that they have been preserved through years, and perhaps through centuries.

The Myth of Hephaistos

While everybody knows something of Hephaistos, or Vulcan, few machinists have delved deeply enough into classic lore to have heard of more than one or two of his exploits. According to the old Greek myths, he was the son of Zeus and Hera, a king and queen of the gods. He was born lame, which so incensed Hera that she threw him down from Olympus into the ocean, where he was nurtured by Thetis, who afterwards became the mother of Achilles.

While still a youth, he beat out a magic golden throne, which he presented to his mother in revenge for her cruelty toward him. When she sat down in this it seized her automatically, and held her until Dionysus persuaded him through many potations of grape juice to let her go.

Later he became reconciled to his mother, and passed around a cup of peace to the gods, who, however, burst into unquenchable laughter when they saw him hobbling around on the golden crutches which he had made.

Though the only deformed one among the gods, he was wedded to Aphrodite, or Venus the goddess of beauty. Venus, however, became enamoured of Mars; whereupon Hephaistos forged invisible chains with which he captured the goddess and her lover. After showing them to the other gods, he demanded back the dowry he had paid for her and let her go.

He was the artificer of the gods, forging alike their golden furniture, and the thunderbolts hurled by Zeus.

He was supposed to have his own castle, which included a workshop on Olympus, but also to do much of his work under the earth. In fact the fire of the volcanoes was supposed to come from his forge.

To assist him in his work, he had formed golden maid servants, which automatically helped to blow the bellows and do his errands.

He is worshipped in the Homeric Hymns as one who "taught glorious works to men upon the earth, who previously dwelt in the caves of the mountains like wild beasts, but now instructed in works by Hephaistos, the renowned artificer, they pass their life in each the whole year through in their houses."

Among the mighty works which he was supposed to have wrought for men, were brass footed, fire breathing bulls for King Aetes of Colchis, gold and silver water dogs for Alcinoos, king of the Phaeacians, and the brazen man Talor for King Minos of Crete, which protected the island by walking around it three times a day.

When the armor of Achilles was lost by Patroclus, the mother of Achilles, Thetis, hurried to Hephaistos to ask him to make a new set of armor. As she had protected him when he was abandoned by his mother, Hera, he was glad to do it. As part of this armor he made a wonderful shield on which he forged in minute detail a great number of scenes. In doing this he used twenty bellows, all of which worked automatically.

What does this myth mean? By some Hephaistos is considered as a personification of fire as exhibited in volcanoes. Certainly it illustrates the importance which was then attached to the smith, and emphasizes the power which skill in metal working gave. The automatic inventions ascribed to him, represent of course nothing in existence at the time, but unfulfilled ideas, some of which, like the bellows not worked by human power, were realized in a later period.

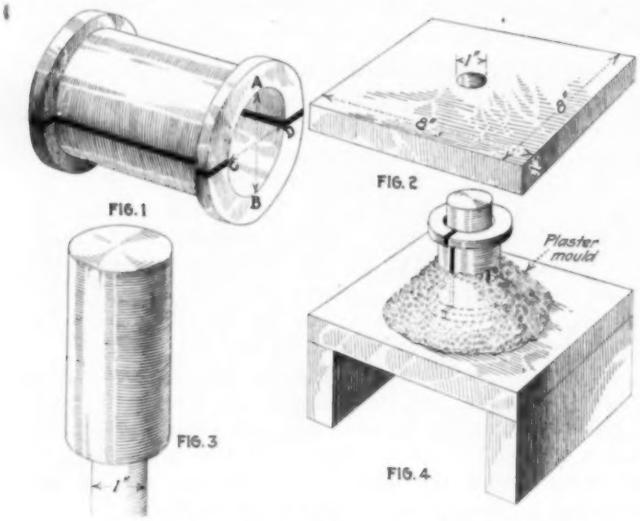
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Babbitting Bearing Shells

By L. C. Fox

It frequently happens that a motor comes into a service station for which duplicate parts cannot be easily or promptly secured, and it becomes necessary to re-



NO. 1. THE SHELL TO BE BABBITTED. NO. 2. THE BABBITTING BASE. NO. 3. THE CORE. NO. 4. THE SHELL READY FOR POURING

babbitt bearing shells in order to avoid tying up a business car for an indefinite period. It is first necessary to melt out the old babbit in the easiest way possible, according to the equipment of the shop. This can be done with a blow torch, a bunsen burner, or over a small blacksmith's fire. The inside of the shell should then be cleaned perfectly and dipped in any good soldering acid, after which it should be carefully tinned, including the fillets.

Make shims the width of the shell and of such thickness as will hold the two halves apart from $\frac{1}{16}$ to $\frac{3}{32}$ in. more than the distance across the shell. This is shown in Fig. 1, the distance *A B* being at least $\frac{1}{16}$ in. greater that *C D*. This allows more bearing metal in the crown of the bearings than on the sides.

With the shims in place, wire the two halves together so that the bearing can be easily handled for babbitting and turning.

Take a cast-iron plate of any convenient size, such as 6 or 8 in. square and 1 in. thick, and flat on one side to be used as a surface plate. Drill a 1-in. hole in the center to be used in locating and holding a wooden core. The plate is shown in Fig. 2 and the core in Fig. 3. Make a wooden core, as shown in Fig. 3, with the end turned down to fit the hole in the plate, and the body about $\frac{1}{16}$ in. smaller than the diameter of the crankshaft. It should be about an inch longer than the bearing itself. Place the core in position in the plate, center the bearing around the core, and make a plaster paris mold around the bearing, as shown in Fig. 4. The plate should be raised off the bench two to four inches. With the shell held in place by the plaster mold, heat it with a blow torch until the tin starts to melt. Have the babbitt close by and have it hot.

It is quite important that the blow torch give a clean flame for, if the surfaces to be tinned are not clean, the tin will not stick. If a clean flame is impossible, get a piece of round iron or steel, a little smaller than the inside diameter of the shell, and heat it red-hot. This can be used in heating the shell in place of the blow torch when necessary.

Pour the babbitt quickly, so as to secure a complete union with the shell. The core should either be greased or wrapped with a piece of paper so that it can be easily removed. When the bearing has cooled, the plaster paris mold can be broken away and the bearing put in the lathe and held in a four-jawed independent chuck. Bore the hole and finish it smoothly.

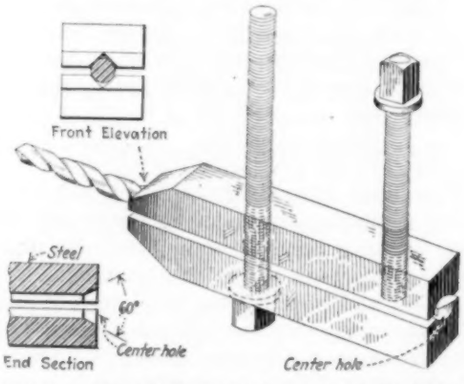
If there are a number of bearings to be made time can be saved by making a wooden mandrel to fit the bore, holding the mandrel in the chuck and forcing the bearing on the end. After the lathe work has been done the bearing can be cut in half with a hacksaw and the edges finished.

Parallel Clamp as Drill Holder

By Charles E. Frank

A parallel clamp may be made to serve as a holder for small twist drills when using them to drill holes in work that is mounted upon the faceplate or in the chuck of a lathe.

When using a drill in this manner it is essential that the operator be able to "feel" the cut in order to avoid



HOLDING SMALL DRILL IN PARALLEL CLAMP

breaking the drill, and a drill chuck held in the tail spindle will not permit this, even when a chuck with suitable shank is available; while holding the chuck in the hand with the end of the shank on the point of the tail center is a clumsy method at best, and often defeats its purpose by reason of the weight and the compara-

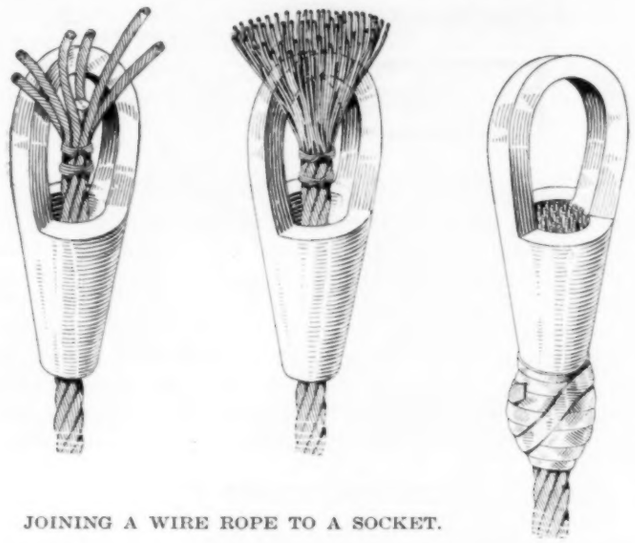
tively long distance between the center and the point of the drill.

The clamp should be taken apart and a small V-groove cut or ground lengthwise of each jaw, care being taken to make the groove of accurate shape and exactly central. With the clamp again assembled a center reamer may then be used to make a suitable center hole at the square ends of the jaws so that the tool will not slip off the center when drilling. If the jaws are hard, this part of the work may be done with a suitably shaped grinding wheel before the clamp is reassembled.

Attaching a Wire Rope to a Socket

BY E. J. EDWARDS

When wire rope is used in connection with a socket it is important that the socket be attached in such a manner that the full strength of the rope may be depended upon. It is common practice in factories where there is not enough work of this kind to employ an experienced hand on cables, to have the engineer or repair man do the best he knows how. I have seen lead, solder, soft babbitt, etc., used for the purpose of attaching these sockets, by men who were good mechanics but who had no idea as to what material should be used or what should be done to prepare the cables for the operation.



JOINING A WIRE ROPE TO A SOCKET.

The ordinary way of doing the work is to bend back the wires upon themselves, draw them into the basket of the socket, and fill the latter with lead or babbitt. Sockets attached in this manner should never under any circumstances be used on elevators, cranes, or other hoisting machinery, as the socket may pull away from the rope and cause damage to person or property. The reason for this is that the wires are not all engaged and some of them creep into the rope, thereby preventing a perfect contact between rope and socket.

I think one of the most important operations in attaching a wire rope to a socket is to clean thoroughly with gasoline or kerosene, both socket and that part of the rope that is to be in contact with it. The rope is then served at the end with fine wire or strong cord and pushed through the socket; the hole in the latter being large enough to allow the serving to pass.

I use a strong cord for the serving but would recommend a fine, strong wire about $\frac{1}{32}$ in. in diameter to the man who is not accustomed to handling wire rope, as it is less apt to be cut when passing through the socket. It is well to put on three independent servings, so that if one of them should come loose the others will hold.

After the socket is on the rope the latter is opened, the hemp center cut away for a distance equal to the length of the socket, and the wires in the strands separated. This can best be done by using a piece of small pipe or a marlinspike. It is very important that the lay of the rope does not open beyond the basket as this would cause some of the strands to have more strain on them than others.

After the wires and socket have been well cleaned with the gasoline, they should be allowed to soak for five minutes in a solution composed of one-half muriatic acid and one-half water, then rinsed in a similar solution weakened by the addition of one-half more water. Do not use stronger solutions than these. After wiping dry, push the socket over the wires until the latter are even with the top of the basket. Now wrap friction tape around the bottom of the basket and adjacent rope, and fill the basket with melted zinc.

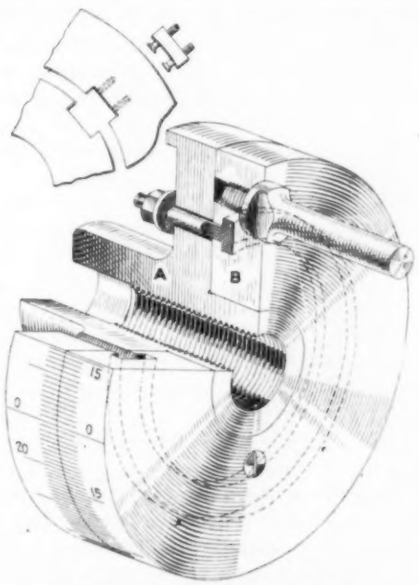
The steps are clearly shown in the illustration. If they are followed out properly there should be no trouble from the rope pulling out of the socket or from undue stresses on individual strands.

Indexing Faceplate for the Lathe

BY WILLIAM F. DATISMAN

I wish to submit to readers of the AMERICAN MACHINIST a drawing and description of an indexing faceplate which I have fitted to an 18-in. toolroom lathe. I have never seen anything like it and, as I find it useful for many purposes, I am passing the idea along in the hope that someone else may be benefitted by it.

The hub of the member *A* should be nicely fitted to the spindle nose in the usual way, having a shoulder projecting from the face that forms a stud or bearing upon which the member *B* rotates. An annular T-slot in the back of member *B* provides for clamping the two members together by means of three T-head bolts spaced 120 deg. apart in member *A*.



AN INDEXING FACEPLATE

The cut out space in the T-slot for the introduction of the bolt heads must be closed after the bolts are put in, by means of small steel plates let into the opening and fastened with machine screws, as shown in the smaller sketch. This is to prevent the bolt heads from catching in the opening and causing annoyance to the operator when rotating the outer member.

Two threaded holes are provided in the face of the outer member to accommodate the driving stud to either large or small diameters; the extra hole being closed with a suitable fillister head screw to keep out chips.

Member *A* is graduated to 360 divisions and numbered at each tenth line. Member *B* is graduated to sixty-one spaces either side of the zero line; the sixty-one spaces corresponding to sixty spaces on the opposite member, thus providing a vernier from which minutes are easily read.

This tool was made entirely upon the lathe with the exception of graduating, which was done upon a Farwell gear hobber provided with a special attachment for that purpose. It is very useful in cutting multiple threads or for resetting a thread tool after regrinding.

It also renders valuable assistance in laying out round work that must be accurately divided, or it may be used to index small reamers, taps, etc., by means of a tool held flatwise in the toolpost while the carriage is traversed by hand.

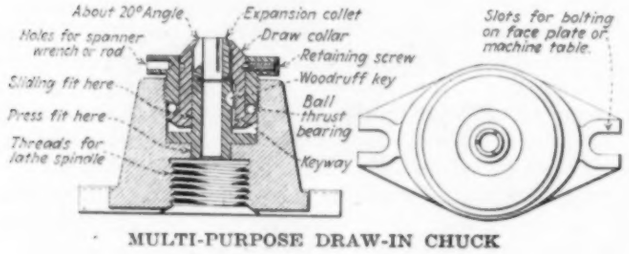
A Multi-Purpose Draw-In Chuck

By E. E. Lakso

The construction of the chuck should be quite clear from the sketch and I need not go into a description of it, but will endeavor to show some of the uses to which it may be put.

In turning small eccentric pins it has no equal. The chuck is bolted to the faceplate of a lathe at the required distance off center, and stock of the size of the larger diameter is used. By using a stop, or a collet with a shoulder at the inner end, all pieces can be made of the same length. For holding small round pieces on the milling machine for milling flats or slots on them it is very convenient. A key in the base is made to fit the T-slot in the table of the milling machine to hold the chuck in position without depending upon the holding bolts.

For turning or cutting off small stock in the lathe



MULTI-PURPOSE DRAW-IN CHUCK

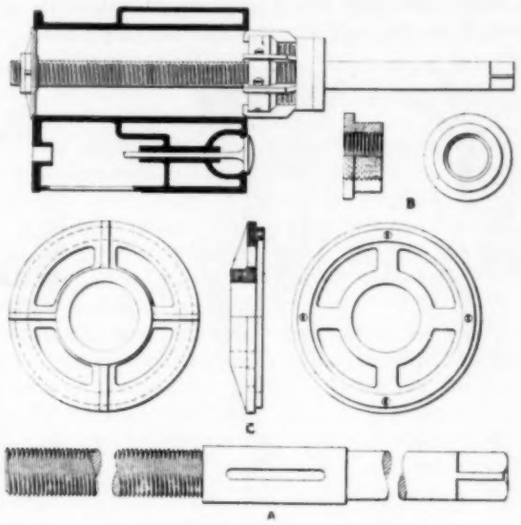
the chuck may be screwed to the spindle nose like any lathe chuck and will hold long rods that may pass through the hollow spindle of the lathe. For cutting pieces to a definite length the collet with the shoulder, or a stop, is again brought into service, allowing the carriage to be clamped in a fixed position.

It comes in handy for holding small round pieces on the drill press and does not bruise the stock as would a vise. In drilling links, wherein there are two holes that must be located at exact distance from each other and all alike, the chuck is fitted with a plug of the proper size and is clamped to the table of the drill press. One hole drilled in all the links, the chuck with the locating plug is now brought into use and with the already drilled hole placed over the plug the other hole is drilled in all the links as accurately as if a jig were used.

Reamer for Refinishing Worn Cylinder Bores of Automobile Engines

By Fred S. Harger

The writer has recently constructed a very satisfactory tool for reaming worn or scored cylinder bores in automobile engines. The construction is such that the



REAMER FOR CYLINDER BORES

reamer is held central and guided in its passage through the bore, while at the same time it is drawn to the cut without the necessity for applying external feeding pressure. The sketch shows the tool in detail as well as its application.

The bar *A* is of machine steel. The pilot portion of the bar is threaded over its full length and is fitted to the flanged nut *B*, which in turn fits the central opening of the lower centering spider *C*. The shoulder at the middle of the bar is made a press fit for the shell of the reamer, which is of the usual expansion design with blades of high-speed steel and may be fastened to the bar with a feather key, a taper pin, or with headless setscrews as desired.

The centering spider has a shoulder ⅛ in. long which is made a tight fit for the lower end of the old bore. As the reamer is turned into the work the threaded pilot draws it forward and at the same time steadies and guides it in a straight line to the opposite end of the bore. When the reamer reaches the spider the latter is pushed out and the small remaining portion of the bore completed by a slight additional pressure upon the upper end of the bar.

Though the tool shown is designed to be operated by hand, and the upper end of the bar is squared for the purpose of applying a wrench, it is a simple matter to fit it with a floating connection that will allow the tool to be driven by a drill press or other convenient machine.

EDITORIALS

Finish the Work of the Arms Conference

SUCCESSFUL beyond the expectations of the men who called it, the Conference on Limitation of Armament has adjourned. There is little doubt that the agreements arrived at, together with the better feeling which has resulted from the gathering around the council table, have definitely postponed, if they have not entirely removed, the danger of war in the East.

There remains the ratification of the various treaties. It is up to the Senate, and the eyes of the country and of the world are upon them. If the treaties are not ratified the evidence will be conclusive that our form of government is no longer capable of functioning in a world where cordial diplomatic and commercial relations between the nations are essential to the progress of civilization.

The Romance of Metal Working

MOST of us in the metal-working industry are so close to our jobs that we have little opportunity to grasp the fascinating romance of man's progress in the fashioning of metal. Perhaps one reason for this lack of imagination is the magnitude of the strides that have been made in the last generation. Epoch-making achievements have followed one another in such rapid succession that we seem to have lost our power to be impressed, and we take them simply as a matter of course.

The niche in the history of the human race which the metal worker is carving out for himself is no uninportant one. Man must eat and must provide clothing and shelter for himself above all else, but in our modern form of life he would have a desperate job in providing these necessities without the aid of the metal worker and his products.

There was a time when the head of the family could sally forth with his bow and bring down a deer with a flint-headed arrow, or knock over a rabbit with his club. With a few nuts and berries to piece out the menu he then had plenty to eat and could fashion clothing from the pelt of his kill. Men were few then, however, and animals were many. The case is different now and the farmer must till and sow and reap for all of us with some of the most complicated of the metal worker's contrivances. Similarly with our garments—carding, spinning and weaving machinery form a vital link in the chain between the raw wool or cotton and the back of the wearer.

And then transportation—without it in its present high state of development the evolution of our modern civilization would be impossible. The railroads, the motor trucks, even horse-drawn vehicles would never have existed without the metal worker's skill and vision. And now we have left the ground and are transporting passengers and goods by airplane and airship, thanks once more to the metal worker.

These are but a few of the many activities of present-day civilization which depend upon the work of the molder of metal but if there were no others his place would be secure. Too little attention is paid to the romance of his achievements, but then we are not living in a romantic age. They thought more of this phase in past generations and have handed down many myths, sagas and legends of the marvelous deeds of the metal workers of old for us to smile at, perhaps, but to ponder over at the same time. A few of these old tales have been collected for the AMERICAN MACHINIST and will appear from time to time. They will be very short. The first is printed on another page of this issue and tells of the magical deeds of Hephaistos, armorer of the gods upon Olympus.

Another Reason Why Commercial Aviation Languishes

PEOPLE are just beginning to wake up to the major importance of adequate terminal facilities for any transportation system. The more advanced the means of transportation and the greater the value of speed, the more important becomes this factor. Consequently when we get to aerial travel where speed is the first consideration, the location and adequacy of the terminal facilities determine the commercial feasibility of the whole scheme.

Henry M. Crane, the engineer whose eminence in his chosen work led to his selection as the man to put the Hispano-Suiza airplane engine into production in this country, in making his report to the S. A. E. on the development of aviation during 1921, told a story which emphasizes the point we are trying to make.

A business man who wanted to decide for himself whether transportation by air was a commercial possibility made a trip to Atlantic City. He left his office on Forty-second Street, New York City, and made a run in a taxi up Riverside Drive for about forty blocks. Here he had to walk down a long flight of dirty steps, cross the railroad tracks and pick his way through a dark, riverside yacht club to a dingy rowboat with an inch of water slopping around the bottom. He was rowed out to the seaplane only to find that the pilot had not finished taking on gasoline. More delay.

Flying time to Atlantic City was two hours as the result of the head wind prevailing at the time of year when the trip was made. A good landing was made in the inlet and then the voyager sat and fumed while the pilot signaled for a rowboat to come out from shore. The boat finally arrived and after a tedious trip deposited the passenger on shore at a point where no taxicabs were in evidence and the trolley cars ran about once in every so often.

He reached his hotel some four hours after leaving his office. By railroad it would have taken him three and a half and with less discomfort and annoyance. As a result of the trip our friend is not convinced that the dawn of universal commercial aeronautics is imminent. And all because the terminal facilities were inadequate.

Publicity for Trade Data

MR. HOOVER has performed another act of real service to business in general by his painstaking work regarding the attitude of the Attorney General as to trade associations of various kinds. The so-called "Hardwood decision" has caused much uneasiness in many quarters. As pointed out by the Attorney General in his reply to Mr. Hoover's concise questioning, the unlawful part of the work of the association named was in confining the information to the members of the association.

The whole decision is a victory for those who advocate more publicity in all business dealings. With data as to business conditions available to consumers, as well as to manufacturers and to dealers, a more stable condition of the market could, in the opinion of many, be depended upon.

Mr. Hoover favors wider publicity as to business data, believing that by helping both buyer and seller it will aid business in general. The income tax laws have broken the ice and made us a little more accustomed to giving statements of what we formerly thought was secret information. There is every indication that we are to have more publicity and it is believed by many that it will be better so.

Good Material Regulation Makes a Difference

IF THERE is any one item which affects the economical production of machine work most vitally it is probably that of keeping a constant supply of material going through the shop. It is comparatively easy to go over a list of parts and place orders for all the material. And in too many cases so doing is the end of the matter until the shop strikes a snag and is held up because some minor part has not been delivered.

No matter how small the shop, getting stock in on time is of great importance. A simple system can be devised by which the proper person will be notified of expected delivery long enough before the material is needed, to permit reordering or following up the delinquent source of supply.

There is probably no better way to handle this problem than to use a simple chart containing the different items needed. This chart can show the dates on which materials of various kinds are due and whether they have been delivered or not. It can also be arranged to show the production department that everything is ready to go ahead. Either an extension, or another chart, can show the progress of the work through the shop. Such a chart is not only a record of progress, but when posted is an incentive to keep up to schedule.

In this connection we can readily see the effect of good or bad methods of handling material in the shop. With good facilities such as tote-boxes, racks and trucks, the time lost between operations or departments will be slight. Where good handling facilities are not provided, work piles up and prevents that steady movement necessary for uninterrupted production.

Seeing that ordered material is actually delivered on time, and its speedy and economical handling play an important part in production costs. Now is a good time to study these two phases of the system in use in your shop. It is quite possible that a slight change in method may add much to the smoothness with which work will flow through after the orders begin to come in in force.

Inferior Cutting Tools Are Costly

THESE are particularly trying days for the shop man who wishes to practice real economy in making his purchases. He is confronted with the necessity of making every dollar count and yet faced with the danger of losing ten dollars for every dollar he apparently saves.

No better illustration of this can be had than to consider the case of such cutting tools as drills, taps and milling cutters. There is a great temptation to save a few dollars here and there in purchasing these and similar tools. They all look much alike on the outside. But it takes only a little dropping off in production to eat up all the saving on a milling cutter. The nose of the spindle of a milling machine which cost two thousand dollars is a poor place to save a few dollars in inferior cutters.

The purchasing agent who knows only the dollar sign, can do a lot of harm at such a time as this. This is especially true in places where, for some reason or other, the banker may be having a finger in the business. Not realizing the difference in production between medium and first quality cutters, any saving in the first cost appeals to the financial man of the institution. Cutters all look alike to him and he pats himself on the back for the economies effected.

Real production costs, however, tell a very different story. There is no better place to "save at the spigot and waste at the bung" than in the matter of cutting tools. They are the business end of the machine tool and without good cutters there is little chance for economical production.

This is the time when the men responsible for results should protest, loudly if necessary, against this false type of economy. Even if they are overruled they should go on record as protesting against the purchase of inferior tools. Then when they fail they can put the failure squarely up to the management, where it belongs.

It never pays to handicap a good machine with a poor cutting tool!

We Still Have the Small Shop

WE BECOME so accustomed to thinking of large plants with men numbered by thousands, that we somehow get the notion that the small shop is a thing of the past, or at least passing. And then some one trots out some new statistics that wake us up to the fact that after all the big shop is still the exception.

This time it is the National Industrial Conference Board that is responsible for the facts that jar us a bit. According to the board only two per cent of the manufacturing establishments in the country employ one hundred or more men. When it comes to the total number of employees, however, the large shops, that is the shops of one hundred men or more, employ almost two-thirds of the total.

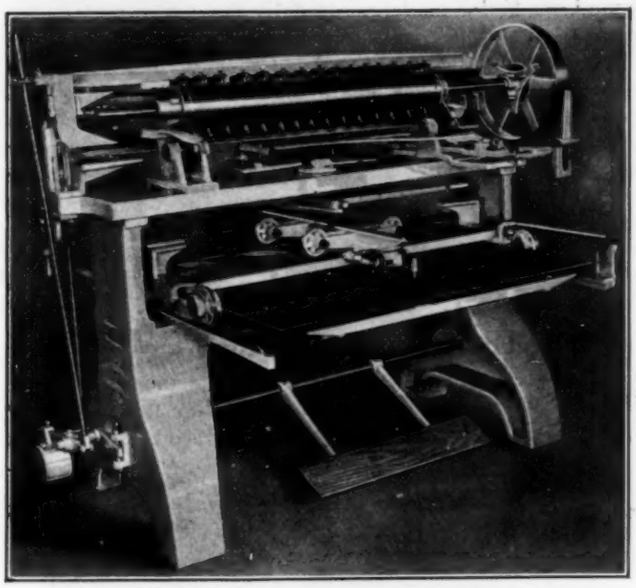
But the fact that ninety-eight per cent of the shops are small indicates clearly that there is still a field for the standard types of machine tools. The engine lathe and planer still have their place and will continue to be used for many years to come.

The figures point out that while we have an increasing number of large shops with their more or less specialized machinery, we must not overlook the fact that the small shop is still a powerful factor in the machinery field.

Shop Equipment News

Dover Pantograph Marking Machine

The pantograph machine shown in the accompanying illustration has recently been placed on the market by George W. Dover, Inc., Eddy St. and Thurbers Ave., Providence, R.I. It is intended primarily for marking in multiple by means of diamond-pointed tools. The design to be reproduced is placed on the table at the front of the machine, and traced by means of the point connected to the pantograph motion. The pantograph operates the arm holding the diamond-pointed tools. The number of these tools can be varied, and as many as thirty-four may be employed. They cut both on the top and on the bottom of the work or roll.



DOVER PANTOGRAPH MARKING MACHINE

The roll shown is of the type usually employed for printing silk and calico, and is made of copper. After being coated with varnish, it is placed in the machine. When the tracing point is run over the design, the diamonds cut through the coating and into the copper. The designs are made in multiple, so that it is possible to cover the entire length of the roll at one time. After the roll has been cut over its entire periphery by indexing it, it is immersed in an acid etching solution.

Another use for the machine is in marking lenses with trade marks that are invisible to the naked eye. A table is mounted on the machine in the position occupied by the roll. The top set of diamonds is set in rotation by individual motors mounted on each spindle, so that from twelve to fifteen lenses per minute are cut simultaneously.

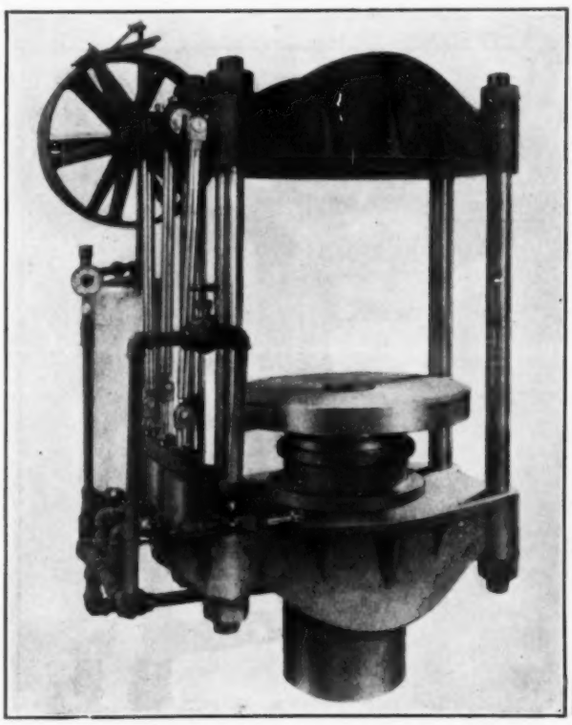
The machine is ordinarily driven without power, the movement of the diamonds being obtained from the pantograph that is driven by hand, while their pressure against the work is controlled by the pedal. The machine is said to be very sensitive in its operation and rigidly constructed. A total of fifty-four ball bearings are used. The machine will handle a roll 60 in. long.

West Hydraulic Tire Press

An hydraulic press for use in pressing solid rubber tires for automobile trucks on and off their wheels, is shown in the accompanying illustration. It has recently been placed on the market by the West Tire Setter Co., Rochester, N. Y. A ram 16 in. in diameter is employed to give a maximum pressure of 250 tons at the platens. The large ram size is stated to have an advantage in that it does not require an excessive initial pressure on the oil used to drive it.

The frame is made of cast steel. The top platen is cast solid with the top resistance piece; the bottom platen is steel and removable from the ram. The construction is intended to prevent the springing that may occur when structural steel beams are employed. The platens are 42 in. in diameter. The maximum vertical distance between them is 37 in., while the stroke of the ram is 33 in. The four vertical strain rods are each 4¼ in. in diameter, and are 43 in. apart.

The press is driven by a belt on a 30-in. pulley running at 175 r.p.m. The pump is located at the side of the lower resistance member. It has three plungers, one large and two small. The larger plunger, 2 in. in diameter, is intended for operation at low pressure only, and is utilized for filling the pipes and cylinder quickly. When a pressure of about 200 lb. per square inch has been reached, the large plunger is automatically cut out by means of a by-pass valve. The two small plungers complete the pressure, so as to build up the required tonnage on the work. The machine has a height over all of 9 ft. 3 in., although the height from the floor line to the top of the driving pulleys is 7 ft. 3 inches.



WEST 250-TON HYDRAULIC TIRE PRESS

Artisan 11 x 24-in. Gap Lathe

The Artisan Manufacturing Co., Cincinnati, Ohio, has lately brought out the gap lathe shown in the accompanying illustrations. The lathe is provided with a

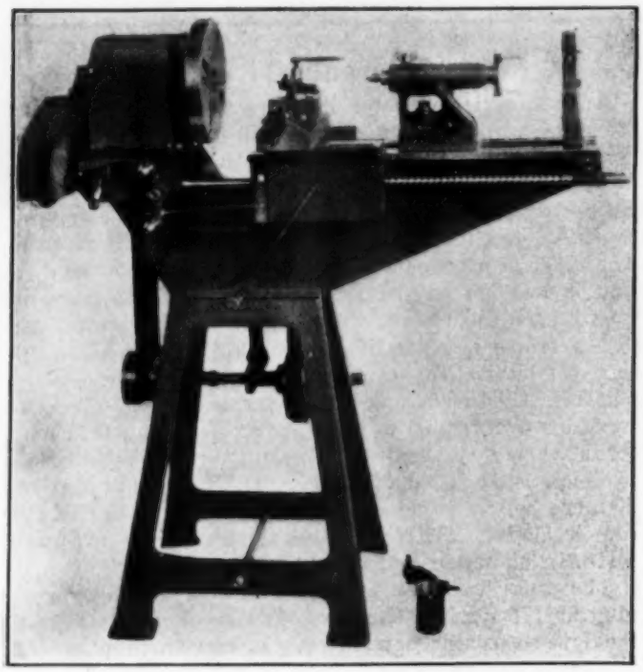


FIG. 1. ARTISAN GAP LATHE (FRONT)

quick-change feed box containing, besides the usual gears, a clutch for engaging and disengaging the feed. The clutch is operated by the lever just below the gap shown in Fig. 1. The double-crank handle at the right of the feed box is for manipulating the feed by hand and may be used either in the position shown or removed and attached to the end of the lead screw. All standard threads from 8 to 224 per inch can be cut, including 11½-in. pipe thread.

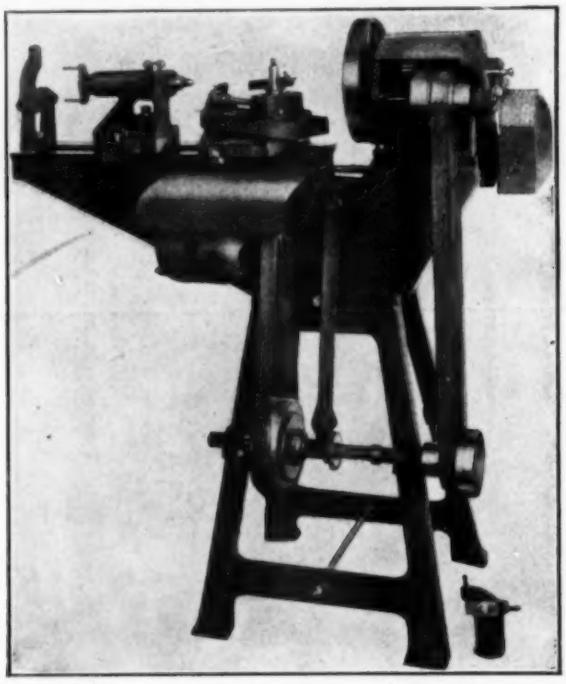


FIG. 2. ARTISAN GAP LATHE (REAR)

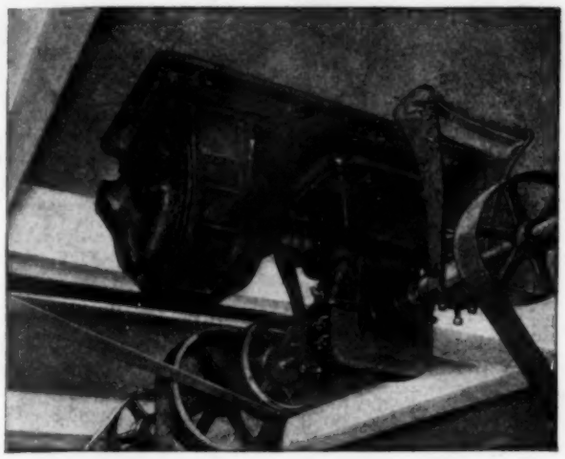
The lathe swings 6¼ in. over the carriage and 16 in. in the gap. An adjustable plug at the left of the apron, bears on the shelf below the gap and supports the carriage when it is partly bridging the gap.

The cross-slide can be swiveled for turning angles and when set for straight facing is doweled in position, the dowels having squared ends to fit the toolpost wrench. The countershaft is mounted in self-aligning bronze bearings secured to the legs at the rear and may be driven from a lineshaft or from a ½-hp. motor attached to the bed of the machine, as shown in Fig. 2. In either case the drive is by a friction pulley with cone-type clutch and operated by the lever to be seen at the bottom of the bed in Fig. 1.

The cone pulley on the headstock is geared to the spindle. Sliding back gears together with a three-step cone pulley give six speeds, which are arranged in geometrical progression. The hole through the spindle is 1⅛ in. in diameter and has a No. 5 Morse taper. The centers are No. 2 Morse taper and the live center is inserted in a reducing collet in the spindle. A follow rest and steadyrest are included in the regular equipment.

Cleveland Worm Drive for Line Shaft

An installation of a motor driving a shop line shaft through worm gearing is shown in the accompanying illustration. This drive arrangement has recently been



CLEVELAND WORM DRIVE FOR LINE SHAFT

placed on the market by the Cleveland Worm and Gear Co., Cleveland, Ohio. A number of advantages are claimed for the drive, among which is the ability to transmit power with smoothness and quietness. The connection between the motor and the shaft through the worm and worm wheel eliminates fluctuation in speed due to slip, as may occur with a belt. The large ratio of reduction of the worm makes it possible to use a motor operating at 1,800 r.p.m., even for shafts running at low speed. It is claimed that the drive has an efficiency from 93 to 97 per cent, varying with the ratio of reduction.

In most cases where a steel construction of sufficient strength is available, the reduction unit is mounted on a cast-iron bed plate with the motor, and the whole unit attached to the ceiling. It may be placed in the upright position on a platform. The gearing is rugged and durable, so as to eliminate the necessity for frequent adjustment and replacement. The lower half of the

housing forms an oil bath, providing for the lubrication of the complete unit. The only attention required is the maintaining of the correct amount of lubricant, which action is aided by two petcocks on the side of the housing.

The drive is very compact and, being completely inclosed, requires no safety guards. The fact that it is protected is of special importance in plants, such as those making food products, where extreme cleanliness is desired and where dust is apt to be set in motion by moving belts. It is of importance also, where there are chemicals or abrasive dust that are detrimental to the life of belts.

Sundstrand 14-in. Toolroom Lathe

The Rockford Tool Co., Harrison Ave. and Eleventh St., Rockford, Ill., has added to its line the 14-in. Sundstrand toolroom lathe shown in Fig. 1. The lathe can be furnished with either cone or geared headstocks, that of the former type being similar in general design to the 16-in. Sundstrand lathe described on page 80, Vol. 48, of AMERICAN MACHINIST.

The geared headstock is completely inclosed, with all gears running in oil. Sliding gears are used exclusively. The clutch is of the friction type, and an automatic brake is provided for stopping the spindle when the clutch is disengaged. All speed changes can be made while the machine is in motion. A cover on top of the headstock provides easy access to the gears. The 4-step cone headstock is single back-geared, and takes a 2¼-in. belt. The back-gear ratio is 8½ to 1.

The spindle is made from crucible steel and is provided with taper bearings. The bearings can be easily adjusted by means of a take-up nut at one end of the spindle. They are provided with lamb's-wool felt oilers drawing oil from a reservoir filled from large oil cups.

The bed is well braced and of large depth, to prevent springing. The ways are chilled to increase the wearing quality and finish. The carriage has a full-length bearing surface on the bed. Its ends are provided with bronze wipers with felt inserted, for cleaning and oiling the V's.

The apron is of the box or double-wall construction, as shown in Fig. 2. All gears and studs are supported and the entire mechanism inclosed by the inner plate, which is tongued and fastened to the side walls of the apron. A third or out-board bearing supports the rack pinion at its outer end back of the rack. The construction tends to eliminate binding strains in the apron under heavy cuts. The rack pinion can be drawn out of mesh with the rack when thread cutting. The threading nut and longitudinal feed cannot be engaged at the same time. Three oil cups on the apron are provided for oiling the front and rear bearings and worm. The bronze threading nut is fitted in dove-tailed ways and gibbed on one side for wear adjustment.

The end thrust of the lead screw is taken on ball bearings mounted in a bracket at the tailstock end of the lathe. The action of the carriage is controlled by a handle on the reverse or stop rod at the right side of the apron. When cutting threads, the carriage can be automatically stopped by the use of stop collars on the stop rod. When the position of the handle is reversed, the apron moves back to the stop collar at the opposite side and stops automatically, ready to take another cut.

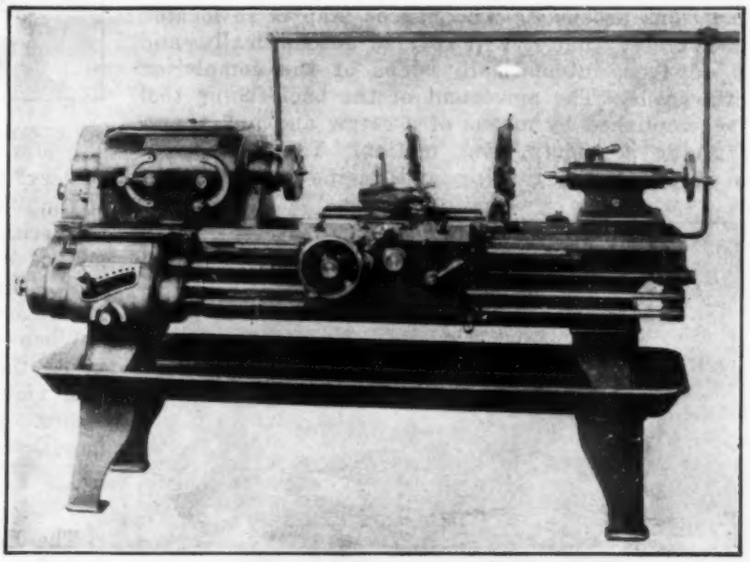


FIG. 1. SUNDSTRAND 14-IN. TOOLROOM LATHE

Specifications—Swing: over bed, 15 in.; over carriage, 8¾ in. Distance between centers with 6-ft. bed and tailstock flush with end of bed, 34 in. Hole through spindle, 1⅛ in. Taper hole, No. 3 Morse. Travel of tail spindle, 6½ in. Feeds, from 6 to 268 r.p.m per inch. Threads, 1½ to 92. Number of spindle speeds, 12. Cutting tool, 1¼ x 1 in. Approximate weight with 6-ft. bed: net, about 2,150 lb.; domestic shipping, 2,300 lb.; export shipping, 2,500 lb. Floor space of 6-ft. bed plain lathe with oil pan, 27 x 82 in.

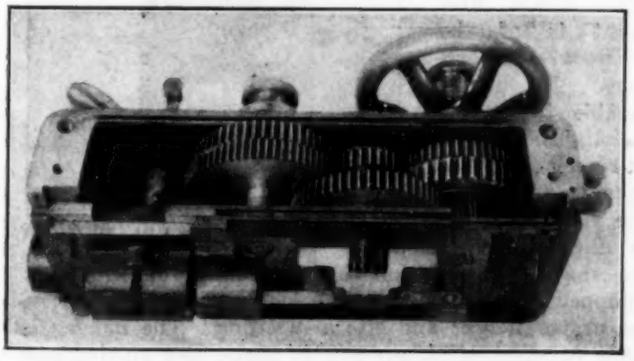


FIG. 2. APRON OF SUNDSTRAND LATHE

When the handle is in the neutral position, all gearing to the gear box is disengaged. A threading dial is furnished to facilitate thread cutting.

The quick-change gear box is arranged for easy operation of the controlling levers. There are eight gears on the cone. Forty-eight thread and feed changes ranging from 1½ to 92 are provided. By an intermediate slip gear beneath the spindle, the gear box can be disconnected.

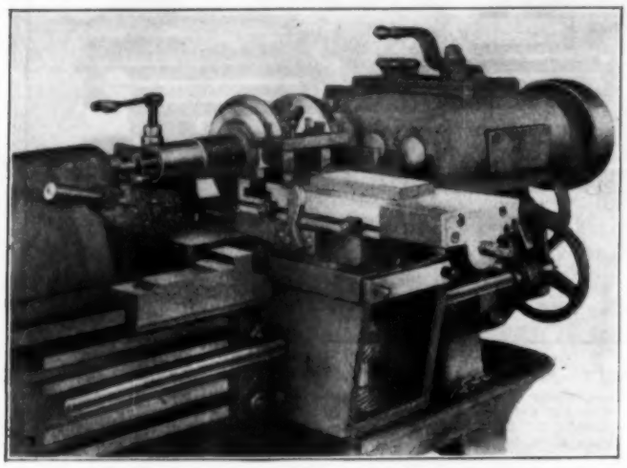
The tailstock has an eccentric clamping device to lock it to the bed. A graduated collar is provided at the rear of the tailstock spindle. The taper attachment has graduations in both taper per foot and degrees. The relieving attachment is so arranged that external and internal cuts at any angle can be made, and it permits taper and helical relieving at the same setting. The relieving attachment can be used in connection with the taper attachment, which takes the jar of the recoil off the crossfeed screw. A draw-in attachment with collets to take bars up to ⅝-in. round can be furnished, as well as special collets.

Seneca Falls Back-Facing Attachment

The Seneca Falls Mfg. Co., Inc., Seneca Falls, N. Y., has recently placed on the market a universal back-facing attachment for use on the Adams "short-cut" lathe. The device, shown in place on the back of a lathe in the accompanying illustration, is operated by power. It is particularly adapted to such work as bevel gears, the bevel cuts being made at the same time that the shank is being turned. Nine in-feeds ranging from 0.003 to 0.050 in. per revolution of the spindle are procurable. The motion is obtained through a train of gearing from the headstock driving a splined shaft at the rear of the machine.

Reversal is accomplished through sliding positive clutches, operated through worm gearing. Twenty-seven reverse feeds, ranging from three to fifteen times whatever forward feed is engaged, enable the operator to secure the proper timing action necessary for back-facing, necking, under-cutting and grooving.

No cams are used. The in-feed stop is so located and operated that it will reverse automatically, and the out-feed automatically stops at the completion of the cycle. The movement of the back-facing tool is accomplished by means of a screw and nut, thereby giving a smooth, even motion. The relation of the feeds to the turning and facing slides of the



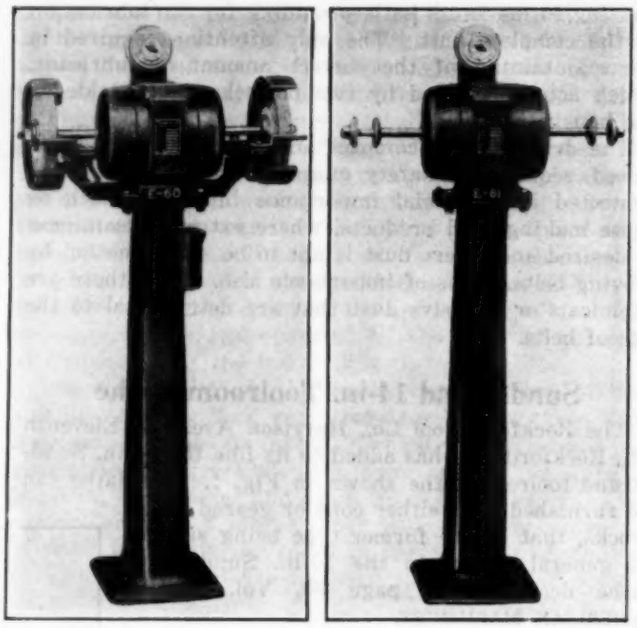
BACK-FACING ATTACHMENT ON ADAMS LATHE

lathe allows of many combinations to suit the work, and makes the lathe a semi-automatic machine. One operator is thus enabled to run several machines.

Columbia Electric Grinder and Buffer

The Columbia Manufacturing Co., Belleville, Ill., has recently placed on the market the grinder shown at the left of the accompanying illustration. The machine is intended for sharpening tools and performing general light grinding in a machine shop or garage. It is driven by a ½-hp. electric motor, operating at 1,800 r.p.m. on single-phase, alternating current of 60 cycles and either 110 or 220 volts. It may take current from a lamp socket. The shaft runs on S. K. F. ball bearings. The motor is completely inclosed, so as to exclude dust.

The grinder can be supplied for bench use, although ordinarily mounted on a pedestal. It is equipped with adjustable toolrests and guards for the wheels, as well as a water pot. Wheels 8 in. in diameter and either 1 or 1¼ in. thick are used. The spindle is ¾ in. in diameter and 23 in. long. A switch is mounted on the motor.



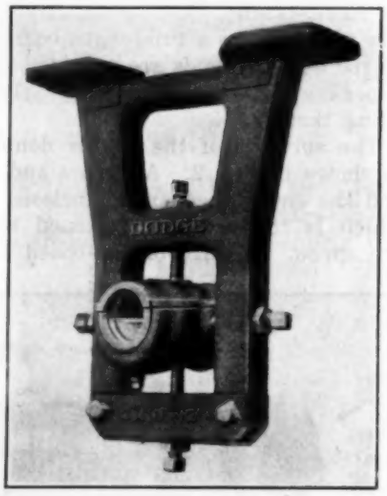
COLUMBIA ELECTRIC GRINDER AND BUFFER

Very little floor space is occupied by the machine. It thus may be conveniently installed near each battery of machines in a shop, so that machine operators need go but a short distance in order to sharpen cutting tools. The spindle is 36¼ in. above the floor. The machine weighs 145 lb. complete.

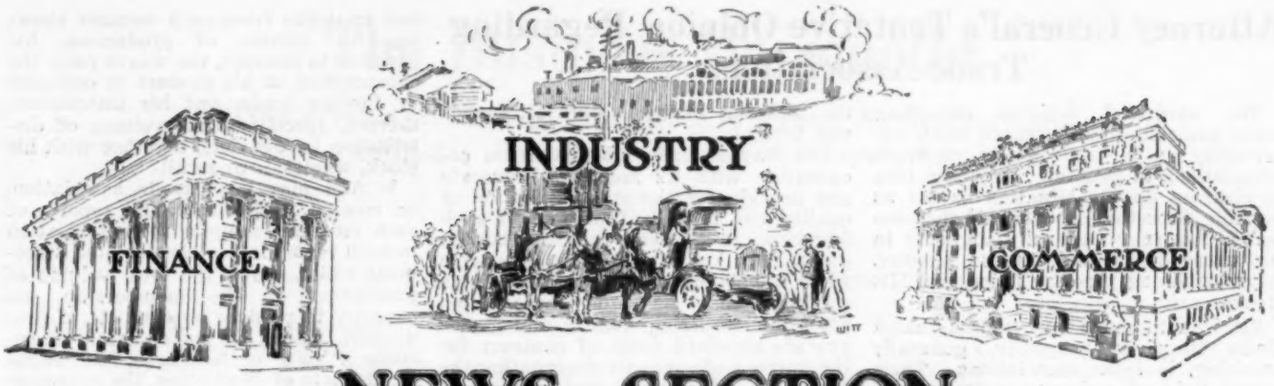
When desired to use the machine for buffing purposes, the guards and other fittings are not necessary. The view on the right of the illustration shows the buffer. The spindle is of sufficient length to permit of moving the work about the polishing wheels.

Dodge Pressed-Steel Hanger

The Dodge Sales and Engineering Co., Mishawaka, Ind., has recently placed on the market the pressed-steel line-shaft hanger shown in the accompanying illustration. The hanger is intended for general use under conditions where extreme vibration is not encountered. It is not adaptable to heavy-duty work, but rather for service under moderate conditions where first cost is of the greatest importance. Its most notable feature is its lightness and strength. The bearing floats in the hanger so as to align itself to the shaft. In addition, by means of the setscrews equipped with locknuts, the bearing can be brought to the proper height and lateral position. The hanger is made of sheet steel, pressed to shape and riveted and bolted together.



DODGE PRESSED-STEEL HANGER



NEWS SECTION

Extent of Recent Sales of Surplus Machinery

The Material Sales Division of the Emergency Fleet Corporation is continuing its sales of surplus machinery, equipment and supplies. Recent sales of machine tools at the Hog Island Yard have amounted to about $75,000, and about $50,000 worth of small tools have been disposed of. The railroads have been consistent buyers and several of the larger roads have their inspectors at Hog Island at the present time.

During the month of December sales amounting to approximately $300,000 were consummated at the yard of the Merchants' Shipbuilding Corporation, Bristol, Pa. Material sold included cranes, air compressors, electric equipment, machine tools, small tools, etc.

Recent sales of machine shop equipment at the Wilson Point Ship Yard, South Norwalk, Conn., amounted to approximately $6,000.

First Aid Course for Industrial Employees

The State Department of Labor, New Jersey, has arranged for a series of lectures on first aid to injured and sick employees at all industrial plants in Newark and vicinity. The course of instruction will extend for a period of six weeks, and local factories have been requested to have at least one representative present for each fifty workers at the plant. At the conclusion of the series, those attending will be examined in elementary first aid and certificates of proficiency will be awarded to those entitled. The lectures are given free of charge and are under the direction of Dr. Edgar Holden.

Steel Treaters Meet Next Week

Plans have been completed for the sectional meeting of the American Society for Steel Treating, which is to be held at the Hotel McAlpin on Friday, March 3. Fourteen New York and New England chapters are expected to send representatives to this meeting. The society also extends an invitation to non-members to attend the sessions.

A program of seven technical papers has been arranged, varied by an informal dinner and get-together meeting. Honorary membership will be conferred on Dr. John A. Matthews. George L. Norris is chairman of the general committee.

Implement and Tractor Manufacturers Organize

The Manufacturers' Tractor and Agricultural Export Club has been organized by manufacturers of farm implements and tractors, with a view to increasing export business and bringing about greater co-operation and helpfulness in the trade. David A. Anderson, Emerson-Brantingham Co., Rockford, Ill., has been elected chairman; N. G. Snyder, Oliver Chilled Plow Co., South Bend, Ind., vice-chairman; and, as members of the executive committee, W. J. Wieland, International Harvester Co., Chicago, Ill.; P. Aubeck, Avery Co., Peoria, Ill.; and H. R. Jahns, Aultman & Taylor Machinery Co., Mansfield, Ohio. Additional companies in the new organization are Lombard Auto Tractor-Truck Corporation, Waterville, Me.; Rock Island Plow Co., Rock Island, Ill.; Cleveland Tractor Co., Cleveland, Ohio; Minneapolis Steel and Machinery Co., Minneapolis, Minn.; A. B. Farquhar & Co., York, Pa.; Bateman & Companies, Inc., New York, N Y.; and the Parrett Tractor Co., Chicago, Ill.

Automobile Tax Reaches 8 per Cent of Value

The average automobile owner is now paying what is the equivalent to an 8 per cent tax on the assessed value of his car, according to George C. Diehl, president of the American Automobile Association. To tax motor car owners further, as has been proposed in connection with plans for raising the soldier bonus appropriation, would be class legislation of the most pernicious variety, he declared. He pointed out that during 1921 automobile owners paid $120,000,000 for registration fees alone. A fifty-cent horsepower tax would place an additional burden of $150,000,000 a year on car owners. A tax of three cents a gallon on gasoline would cost the motorists of the country $150,000,000. Mr. Diehl analyzes the motorist's 1921 tax bill as follows:

Federal excise tax, passenger cars	$64,388,184
Federal excise tax, motor trucks	11,640,056
Federal excise tax, accessories, parts, tires	39,518,009
State motor vehicle registration fees (est.)	120,000,000
Personal property taxes (est.)	75,000,000
Gasoline tax in fifteen states, 1 and 2c. per gal., 1922 (est.)	10,500,000
Local motor, franchise, mileage, business, etc. (est.)	10,000,000
Municipal registration and license fees (est.)	1,000,000

Hoover Advocates Aid to Railroads

In treating railroad ills, Secretary of Commerce Hoover advocates the removal of the cause before "aching actually sets up." This is particularly true, he declares, of the matter of equipment. Steps must be taken now if car shortage later on is to be avoided. He compared the railroad situation with that in the agricultural industry. In the latter industry the acuteness of the situation was very apparent, and the Government, through the War Finance Corporation and the Farm Loan Board, placed its credit behind the farmer. The mere fact that many railroad troubles are ones of anticipation, he pointed out, should not interfere with the application of the remedy in time to prevent the ache.

Railroads Increase Employees and Compensation

Additional employees to the number of 35,806 were employed by the Class I railroads during October, 1921, than were employed in September, figures just made public by the Interstate Commerce Commission show. The increase in compensation was $13,630,137. The 2,528 employees in the Class A professional engineering group received $594,929 in October of 1921; the 3,193 employees in Class B received $584,150, while the 2,622 employees in the subprofessional class received $373,501.

Norton Company Changing N. Y. Salesrooms

The Norton Company, manufacturer of grinding machinery, of Worcester, Mass., will abandon its New York salesrooms on May first. According to plans just announced by S. J. Bell, New York manager, the company will retain sales offices in the Dodge Building, 53 Park Place, but the stock from the old salesrooms on Chambers St. will be carried by Topping Bros., at 122 Chambers St. It is also announced that a sales agency for northern New Jersey will be established with Ludlow & Squier, in Newark, N. J.

Machinists to Meet Miners

The International Association of Machinists has accepted the invitation of the United Mine Workers to participate in the conference on the coal wage agreements.

Attorney General's Tentative Opinion Regarding Trade Associations

The hardwood decision regarding trade associations has caused much uncertainty as to the legality of trade associations in general. With the idea of clearing up the situation as far as possible, Secretary Hoover laid the case before Attorney General Daugherty in his usual direct and concise manner. After outlining the case in general Mr. Hoover said:

"It is with much earnestness that I claim there is propriety, generally speaking, in trade associations. Their lawful field of endeavor is large, and their activities work for promotion and advancement of the public welfare and for progressive economic organization. In making this statement, I am not unmindful of the fact that the impression exists with a small minority that individual prohibited acts may be accomplished by organization under the disguise of a trade association. However, to make my position clear regarding the trade associations, the existence of which I advocate, I desire to say that I have always taken the view that no body of men could combine in the form of a trade organization and do any act or thing forbidden by law, if it was undertaken by them outside of a trade organization. The character of trade organization, the existence of which should be preserved, is one that carries lawful purposes only in its articles of association; its activities must be in harmony with its declared purposes. The articles of association, with their lawful, declared purposes, must not be used as a mask to hide unlawful purposes. In other words, the organization can not be used to conceal or disguise any contract, combination, conspiracy, agreement, or understanding, secret or otherwise, on the part of the officers of the organization or on the part of the membership or any part thereof to engage in activities in restraint of trade or otherwise in violation of the anti-trust laws.

"If information regarding production, capacity and distribution by districts, with average prices for grades, brands, sizes, styles, or qualities sold in the respective districts for specified periods of time could be given to the public at the same time that such information is available to the members of an association, in my judgment, great public good would result. With this information available, everyone dealing in the products of a given industry, whether buyer or seller, would have the same information regarding conditions and, in dealing with one another, would have knowledge of the same facts upon which to form their judgments as to the proper course to pursue."

Then follow these specific questions:

(1) May a trade association provide for its members a standard or uniform system of cost accounting and recommend its use, provided that the costs so arrived at by the uniform method are not furnished by the members to each other or by the members to the association and by the latter to the individual members?

(2) May a trade association advocate and provide for uniformity in the use of trade phrases and trade names by its respective members for the purpose of ending confusion in trade expressions and for harmony of construction as to the meaning of trade phrases, names and terms?

(3) May a trade association, in co-operation with its members, advocate and provide for the standardization of quality and grades of product of such members, to the end that the buying public may know what it is to receive when a particular grade or quality is specified; and may such association, after standardizing quality and grade, provide standard form of contract for the purpose of correctly designating the standards of quality and grades of product; and may it standardize technical and scientific terms, its processes in production, and its machinery; and may the association co-operate with its members in determining means for the elimination of wasteful processes in production and distribution and for the raising of ethical standards in trade for the prevention of dishonest practices?

(4) May a trade association collect credit information as to the financial responsibility, business reputation, and standing of those using the products of the industry; and may the association furnish such information to individual members upon request therefor, provided such information is not used by the association or the members for the purpose of unlawfully establishing so-called "black-lists."

(5) May a trade association arrange for the handling of the insurance of its members, including fire, industrial, indemnity, or group insurance. In other words, can the members of an industry, through the agency of a trade association, arrange for or place all of the insurance of the members?

(6) May a trade association, in co-operation with its members, engage in co-operative advertising for the promotion of trade of the members of that association engaged in the particular industry; and may the association engage in such form of promotion by furnishing trade labels, designs, and trade-marks for the use of its individual members?

(7) May a trade association, for and in behalf of its members, engage in the promotion of welfare work in the plants or organizations of its members, which welfare work includes sick benefits and unemployment insurance for employees, uniform arrangements for apprenticeship in trade education, the prevention of accidents and the establishment of an employment department or bureau for co-operation with employees?

(8) May a trade association, in co-operation with its members and acting for and in behalf of its members, handle all legislative questions that may affect the particular industry, regarding factories, trades, tariff, taxes, transportation, employers' liability and workmen's compensation, as well as the handling of rate litigation and railroad transportation questions?

(9) May a trade association, in co-operation with its members and acting for and in their behalf undertake the promotion of closer relations between the particular industry and the federal and the state departments of government which may have administration of laws affecting the particular industry in any form?

(10) a. May a trade association collect statistics from each member showing his volume of production, his capacity to produce, the wages paid, the consumption of his product in domestic or foreign trade, and his distribution thereof, specifying the volume of distribution by districts, together with his stock, wholesale or retail?

b. And may such trade association, on receipt of the individual reports of each member, compile the information in each report into a consolidated statement which shows the total volume of production of the membership, its capacity to produce by districts of production, which, in some instances, include a state or less area, the wages by districts of production, the consumption in foreign or domestic trade by districts, the volume of distribution by districts, and the stocks on hand, wholesale and retail, by districts?

c. And if, after compiling the information as aforesaid, the information received from the members as well as the combined information is not given by the association to any other person, may it then file the combined statement with the Secretary of Commerce for distribution by him to the members of the association through the public press or otherwise and to the public generally and to all persons who may be in any way interested in the product of the industry, it being understood that the individual reports for the members should cover either weekly, monthly, quarterly, or longer periods as may be deemed desirable by the members, and, when a period is adopted, the report for each member shall cover that period, and the combined report shall be for that period?

(11) a. May a trade association, at the time it collects the production and distribution statistics above outlined, at the same time have their members report the prices they have received for the products they have sold during the period taken, specifying the volume of each grade, brand, size, style, or quality, as the case may be, and the price received for the volume so sold in each of the respective districts where the product is sold?

b. And may the association, without making known to any person the individual price reports of any member, consolidate all of the reports into one, and show the average price received for the total volume of each, grade, brand, size, style, or quality, as the case may be, distributed in each district covered by the distribution statistics for the period covered by each individual report?

c. And may the association after making such compilation send the compiled report as to average price, as aforesaid, to the Secretary of Commerce, to be by him distributed to the public and to any or all persons who may be interested in the particular industry making the report?

Except for pointing out different phases of the trade mark situation, No. 6, Mr. Daugherty agreed with Mr. Hoover. And this difference here was due to a misinterpretation of Mr. Hoover's meaning, which meant the using of some such slogan as "Made in Grand Rapids" in connection with distinctive trade marks for each manufacture.

These questions may be studied to advantage by members of various trade associations. Mr. Daugherty's opinions are not final, but merely tentative.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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Unquestionably the most important event in the business world last week was the sensational rise in the price of wheat, which sent the May contract in the Chicago market up to $1.41⅞ on Wednesday. It is true that by this time the farmers have sold most of last season's harvest and, therefore, will not be directly benefited until the 1922 crop is marketed, but the advance is nevertheless significant. In connection with the rise in other grains, as well as in pork and cotton, the strength of the stock market and further decided easing in money rates, it tends to confirm the diagnosis previously made in these articles that we are at the beginning of a period of credit expansion induced by the conversion of assets hitherto "fixed" into marketable securities.

Take for instance the sale of $75,000,000 farm loan bonds a few days ago. They are secured by mortgages on farm land worth probably $150,000,000. Until the present credit machinery was provided and as long as the employment of credit was restricted by its high cost most of this capital was static and inert, but half of it is now represented by these bonds which can be used as collateral upon which to borrow at almost any bank.

As for every loan made there must be a corresponding increase in the deposits of the bank where the proceeds of the loan are deposited the result will be a greatly accelerated circulation of the bank check currency used to put this augmented supply of credit at work.

CREDIT EXPANSION

This is but one illustration of how in the development of modern credit machinery we have succeeded in making it possible to use the same capital over and over with great rapidity just as in the triple expansion engine the same steam is used over three times before it is condensed into water and has to be returned to the boiler to be again converted into steam.

I stress this point because in attempting to discern the probable course of business it is important to realize the extent of the credit expansion which modern machinery will permit. When this expansion provides a surplus, as at present, interest rates decline until the low cost of borrowing attracts speculative demand for funds to buy bonds, stocks and goods.

It must be admitted, however, that one of the chief propelling forces in this inflationary cycle has been somewhat weakened by the developments of the week. The probability of a Federal soldiers' bonus has been decreased because its proponents are discovering that they cannot pick the funds to pay it out of the air and that it seems impossible to find any new taxes on which general agreement can be reached. The sales tax has been revived despite the improbability that even with President Harding's support it can be put through the House. The obstacles in the way of finding a new source of revenue may lead to a postponement of the entire program until the next fiscal year, and it is not impossible that the bonus scheme will defeat itself because of its inherent impracticability. Appreciation of this caused Liberty bonds to turn upward last week after a steady decline since Jan. 13, the unlucky day on which the Republican leaders decided on the plan.

PRICES MAY GO UP

It is still possible that the present obstacles in the way of increased taxation will be dodged by selling bonds, and even without such a temporary evasion of the issue with the taxpayers new financing in 1922 is likely to be almost as large as in 1921. States and municipalities continue to take advantage of the tax exemption which their obligations enjoy to sell huge amounts of bonds which expand credit in the manner described above, and until their borrowing is checked by rising interest rates the trend of prices is likely to be upward.

There is of course reason for the advance in wheat in the serious condition of the winter crop sown last autumn. An observer just returned from the West told me last week that possibly millions of acres would not produce enough to justify harvesting, and world supply and demand seem to be in just that delicate position of near-equilibrium which makes the market sensitive to crop reports. It is also very unlikely that we shall have another yield as large as those of the past four years, for the same observer tells me that seed merchants report unusually heavy sales of clover, indicating that more ground than usual will be turned under. It is also known that most of the brood sows are being retained on the farms with the expectation of materially increasing the number of hogs raised this year.

Therefore, it is probable that the apparent surplus of corn will take care of itself in the same way that the surpluses of cotton, wool, coffee and other staples have in the past and that the surplus of sugar is likely to in the future — by automatically curtailing production and stimulating the discovery of new outlets for consumption. All this means, as Eugene Meyer, Jr., of the War Finance Corporation said last week in summarizing reports from his agents throughout the country, that "the farmer is being put in position to liquidate his debts gradually and that his normal purchasing power—so vital to the commercial, transportation and industrial interests—is being restored."

Supplementing this statement it may be pointed out that the reserve ratio of the Federal Reserve system increased last week to 76.4 per cent, that $15,000,000 was added to the gold holdings of the banks, and that reports are coming in of steadily increasing movement of freight and of higher railway earnings. As the farmers, banks and railroads improve their condition other industries are likely to be stimulated and so the revival will proceed until the cycle is completed.

Steel buying and mill operations are reported better, though new business is taken at the expense of price concessions. Copper is weaker, but buying of the red metal is generally concentrated in about one or two weeks out of six and the satisfaction of the demand withheld at present will probably be accompanied by another price advance.

Raw silk is also lower. These three commodities virtually exhaust the list of price declines, for the tendency of most other staples is upward, and at a grocers' meeting in New York last week specialists in the trade agreed that there would be an advance in the average price of groceries next month and that the market will be firm to rising during the year.

The automobile industry is reported more active and prices probably have touched bottom unless the competition of Henry Ford in the field of higher priced cars compels some radical cuts. In this connection a reduction in the price of Packards may be significant, and the announcement that the International Harvester Co. will sell a tractor at what is asked for the "Fordson" is another piece of news that has a direct interest for the farmer and is indirectly of great importance to every one in the United States, which, despite the growth of its manufacturing industries, is still a country that is mainly dependent upon agriculture for prosperity.

Austrian Iron and Steel Trade

Sales of iron are very favorable in Austria at present. The Alpin Montan Gesellschaft is about to carry out its big new investment program, enlarging the plant, building workmen's houses, etc.

German competition is not much felt. Inland demand takes up all the iron bars and girders, while tin sheets are being exported. Only a few articles which cannot be manufactured in Austria are imported from Czechoslovakia. At present, exports are specially directed to Rumania, as big investments are being made there which cause a great demand for iron products.

In Vienna the dealer's price for iron is an average of 12,000 crowns (1 crown = $0.0003 at present exchange) per quintal — 220.46 pounds. When sold abroad about 15 per cent more is demanded; some sales are effected against the better foreign currencies. One can say that the price for Styrian rod iron (bar iron) is about 8,100 crowns per quintal, while in October it was only 6,400 crowns.—*Commerce Reports.*

The Trend of Business Improvement—Plants Resuming

The Danville Stove and Manufacturing Co., Danville, Pa., has resumed operations at its plant following an extended shut down.

The Lehigh Stove and Manufacturing Co., Lehighton, Pa., has advanced production to a full-time operating basis, following several weeks of curtailment.

The Truscon Steel Co., Youngstown, Ohio, is arranging for early increase in operations at its plant, which is now running at about 60 per cent of capacity. It is expected to advance production about March 1.

The Pennsylvania Railroad Co. has placed its shops at Sunbury, Pa., on a full-time working basis, following a three-day week schedule for some time past. The plant is giving employment to about 550 men. The company has added about 200 men to the working force at its Renovo, Pa., shops, bringing the quota up to 1,350 operatives now at this plant. At the Logansport, Ind., shops, the operating schedule has been advanced from 37 to 48 hours a week, following a number of weeks of reduced operations, and employment will be given to about 900 men here.

The Danville Structural Tubing Co., Danville, Pa., manufacturer of pipes and tubing, resumed operations at its plant on Feb. 7, after an extended period of curtailment.

C. H. Wills & Co., Marysville, Mich., manufacturer of the Wills-Sainte Claire automobile, is increasing the working force at its plant and about 100 men have been added, making a quota of 1,000 operatives. Arrangements are being made to place the works on a full-time schedule this month.

The American Axe and Tool Co., Charleston, W. Va., is adding to the working force at its local plant, under full-time operating schedule. Capacity production is being maintained.

The Lehigh Valley Railroad Co. has reopened its locomotive shops at Sayre, Pa., which have practically been shut down since last April. The plant will work on a four-day week basis, with plans for early increase. The car shops will operate on a five-day week schedule.

The Scranton Stove Works, Scranton, Pa., has resumed production in the molding department, following an extended shut down. Employment will be given to about fifty molders.

The Hupp Motor Car Co., Detroit, Mich., has arranged a production schedule for the present year calling for twice as many complete automobiles as in 1921. Increased operations are now under way at the plant.

The Ford Motor Co., Detroit, Mich., has adopted a full-time production schedule at its tractor plant at Dearborn, Mich., and will maintain capacity operations with regular working force until further notice.

The American Car and Foundry Co., 165 Broadway, New York, has taken a contract from the Chicago, Burlington & Quincy Railroad Co., for 500 refrigerator cars and 500 cars of other type, and will handle the work at its different plants. An order has also been received for the construction of two marine elevator hulls, and this work will be carried out at the Wilmington, Del., plant. The working force at the last noted plant is being increased and about 100 men have been added during the past fortnight.

The Lincoln Motor Car Co., Detroit, Mich., recently acquired by Henry Ford, has resumed active production in all departments of the plant, and a large working force will be employed.

The Reading Iron Co., Reading, Pa., has adopted a night working schedule at its Danville, Pa., works, devoted to the manufacture of iron and steel bars, etc., in addition to regular daily production.

The El Paso & Southwestern Railroad has reopened its shops at El Paso, Tex., following a shutdown of a number of weeks. Employment will be given to about 275 men.

The Penn Seaboard Steel Co., Philadelphia, Pa., has resumed operations at its Tacony plant, following a complete shutdown for some time past. The company is operating at its steel casting plant at Chester, Pa., and has increased production at the works of the Titusville Forge Co., Titusville, Pa., a subsidiary organization recently acquired. Operations at the latter plant are about 300 per cent greater than the minimum point of last year.

The Keystone Auto Top Co., Philadelphia, Pa., manufacturer of automobile equipment, has adopted a night schedule of operations at its works.

The Pennsylvania Railroad Co., has resumed full-time operations at its Todd Cut shops, Wilmington, Del., at the same time adding about 120 men to the working force, making a total of more than 1,000 operatives now employed.

The General American Tank Car Corporation, Chicago, Ill., has taken an order for the construction of 500 box cars and 400 refrigerator cars for the Chicago, Burlington & Quincy Railroad.

The Cadillac Motor Car Co., Detroit, Mich., is increasing production at its local plants to a high-water mark, and has added to the working force until about 7,000 men are now being employed in the different departments. Current manufacture is about 20 per cent greater than at this season under normal conditions.

The Greenfield Tap and Die Corporation, Greenfield, Mass., is giving employment to about 600 men at its plant, and reports current orders booked as about 50 per cent greater as compared with the same month of a year ago.

The Coxe Traveling Grate Co., Port Carbon, Pa., has resumed full-time operations at its plant, giving employment to about 200 men in the shops. The plant has been idle for several weeks past.

The Mount Vernon Car Manufacturing Co., Mount Vernon, Ill., has taken a contract from the Chicago, Burlington & Quincy Railroad for the construction of 1,000 box cars.

The New York Central Railroad Co. is increasing operations at its car shops at Corning, N. Y., and a larger working force will be employed. About 110 men have been added during the past fortnight.

The American-Swedo Iron Co., Danville, Pa., has resumed operations at its plant, following a shutdown since last June.

The Fisher Body Co., Cleveland, Ohio, manufacturer of automobile bodies, is now operating on a basis of 100 complete bodies per day, and plans to bring manufacture up to a point of double this amount at an early date.

The Baird Machine Co., machinery manufacturer, of Stratford, a suburb of Bridgeport, Conn., recently increased the working day in its shop from eight to nine hours. Several of the old employees were re-employed.

The Bridgeport Manufacturers' Association, of Bridgeport, Conn., announces an increase in the number employed in Bridgeport factories, according to statistics gathered up to Feb. 4. The lists are compiled each week by the association and the records show a gradual increase since the first of the year.

The Acme Wire Co., New Haven, Conn., wire manufacturer, recently received an order from the Ford Motor Co. for one hundred fifty thousand coils of wire.

The Foster Machine Co., Westfield, Mass., has increased its production force, and reports sufficient orders to keep 300 employed. A wage reduction of 10 per cent was lately put into effect.

The Bay State Foundry Co., Westfield, Mass., has resumed operations after being closed for more than a year. T. R. Brien, president, reports large contracts placed with the concern by manufacturers in the Middlewest.

Foreign News Notes

According to an announcement of the Federation of British Industry, Hugo Stinnes has acquired a tract of land in the Dutch East Indies where factories for the manufacture of railway material and rolling stock will be erected.

The largest iron and steel works in Upper Silesia, those of Count Henckel von Donnersmarck, have passed into the hands of a British concern to be known as the Henckel von Donnersmarck Beuthen Estates, Ltd., of London. The capital of the new concern is five million pounds sterling. All the plants of the former Donnersmarck company, situated in Austria, Czecho-Slovakia, Italy and Roumania, will also pass into the hands of the new British organization.

The Argentine railways have ordered steel rails to the value of eight million gold marks in Germany. The rails are to be paid for in Argentine cereals.

A demand for all kinds of machinery exists in the Balkan States. A report from Bucharest is to the effect that all the Balkan States are reconstructing and extending their railway lines and that a large demand exists, not only for railway material, but also for up-to-date machine tools, excavating machinery, road machinery, and especially for agricultural implements.

Nearly all the capital stock of the Bavarian Aeroplane Works (Bayrische Flugzeugwerke A-G.), of Munich, has been acquired by the Italian Castiglioni concern, which intends to manufacture passenger and freight automobiles at those works.

A report from Kieff, Ukrania, states that a large demand for locomotives, railway freight cars, motors, modern workshops, tools and agricultural implements exists in the country.

Sidelights on Discussion of Metric System at National Council Meeting

An interesting discussion preceded the adoption, by the National Council of the Chamber of Commerce of the United States, of the resolution proposing that no referendum be had on the metric system matter at this time. A point that had great influence on the gathering was made by George B. Chandler, of the Connecticut Chamber of Commerce, when he said: "If you will analyze the support of the affirmative on this question, you will find among all those proponents there is only one representative of industry. That is very significant. The others are representative of the theoretical." His inference was, as was that of other speakers, that the support of the metric system comes overwhelmingly from theoretical sources, and in those cases where it has the backing of practical activities there is a special reason as was alleged to be the controlling reason for the attitude of the De Laval Separator Co. Howard Richards, secretary of the American Metric Association, was rather surprised when asked if the material that goes into the final assembly of these separators is not shipped from Germany and Sweden. Since these parts are made in metric measurements abroad, the material assembled with them necessarily would be finished in metric.

Edmund D. Fisher, chairman of the Chamber of Commerce committee on the metric system, in explaining that the committee is nearly equally divided on the question, pointed out that the membership was unanimous in its belief that the matter should go to referendum. "If this body should recommend that the subject be dropped," said Mr. Fisher, "you would be taking a step backward. Referendum will mean that the Chambers of Commerce of the country, and the Boards of Trade of the country, would have the opportunity of being educated in this subject and through them the people of the country."

At another point in his remarks, Mr. Fisher said: "On our committee is a man we all love and respect. It is Mr. Towne, of the Yale & Towne Manufacturing Co., who has been constantly opposed to the metric system. Notwithstanding his constant opposition, he takes the ground that it is but fair that the country should have the opportunity of being educated on the subject."

Cost an Obstacle

W. C. Wilson, assistant to the president of the American Institute of Weights and Measures, made the principal anti-metric argument. He read a concise statement from W. R. Ingalls, president of the American Institute of Weights and Measures. Mr. Ingalls said that the greatest obstacle to the adoption of the metric system would be its cost to the people. In the manufacture of metals alone, the cost would be something like half a billion dollars, he said. He calculated this cost on the basis of an investigation which showed that the cost would be around $200 per worker. While he stated that he had not investigated the costs in other fields of industry, he pointed out that there would be a considerable cost per worker and there are 41,000,000 workers engaged in production in the United States.

Continuing, Mr. Wilson said: "If the metric system offers such extraordinary advantages as are claimed for it, is it reasonable to suppose that American manufacturers, who have stood in the forefront of industrial progress and who are thoroughly familiar with the metric system, are so blind to their own interest and so lacking in business intelligence that they must have it crammed down their throats by compulsory legislation? The metric system is used extensively and advantageously by scientists, laboratory chemists and druggists, and it is contended that what is good for the scientist should be of equal advantage to the people. It is upon this fallacy that the metric argument fails.

"Wherever the metric system is in use today, it was adopted by compulsion and is enforced by the police power of the government. There must be something radically wrong with a system of weights and measures that can be enforced only by the imposition of fines and imprisonment. If the metric system cannot win on its merits, it is not entitled to win by compulsion."

C. M. Best, councillor for the Pittsburgh Steel Manufacturers, declared that the manufacturers which he represents ship hundreds of thousands of tons of steel abroad each year. He said it was an insult to the intelligence of these manufacturers to try to cram the metric system down their throats. If it were an advantage to their business they would have adopted it years ago.

England Wants It

George B. Blow, of the Illinois Valley Manufacturers' Association, who is a manufacturer himself, advocated the adoption of the metric system vigorously. "England is very much in the same condition as ourselves," he said. "She is clamoring for metric weights and measures because she has found out that the country is losing foreign business to the metric countries. England is finding out that Germany and other metric countries are getting business from her, particularly in South America. We have no right to vote down a proposition to submit anything to a referendum. This matter should go to referendum as recommended by the committee."

Dr. Charles L. Parsons, secretary of the American Chemical Society, among other things said: "I want to speak for a whole profession. The chemists of America are united in one immense society with 15,000 members. The chemists of America use the metric system daily. They are absolutely united in favor of it. I have no sympathy with the argument of cost. If we followed that argument we would be riding buggies while the rest of the world would be using automobiles."

Machinery for "Leviathan"

In the reconditioning of the "Leviathan" by the Newport News Shipbuilding and Dry Dock Co., $515,000 will be spent for machinery and repairs, which will include its conversion from coal to fuel oil burning, the vessel then being propelled by steam turbine engines which will develop 100,000 shaft horsepower.

Tablets to Ericsson and De Lamater To Be Unveiled in New York

The sixtieth anniversary of the famous battle between the "Monitor" and the "Merrimac", on March 9, is to be commemorated by the unveiling of four bronze tablets. The first is at 2 p.m. at 36 Beach St., New York City, the site of Capt. John Ericsson's residence, by the American Society of Swedish Engineers. An hour later a tablet will be unveiled at 260 West St., the site of the Phœnix Foundry, by the General Society of Mechanics and Tradesmen. Cunard pier No. 54, North River, the site of the well-known DeLamater Iron Works comes next, the Associated Veterans of the DeLamater Iron Works being in charge. The fourth and last tablet is to be unveiled in Brooklyn, at the Continental Iron Works, West and Calyer Sts., by the proprietor, Thomas F. Rowland and staff.

A banquet follows in the evening, simultaneously with a similar celebration in Stockholm, Sweden, which is to be attended by the Royal family and the American Minister and Consul. Communications will be made by cable. The historical significance of the occasion will be best appreciated by those old enough to remember the work of Ericsson and of the others mentioned. The "Monitor" marked an epoch in naval development that has made an impress on the naval and maritime history of all nations.

Harnessing the River Rhone For Electric Power

Detailed information regarding the harnessing of the River Rhone for power, navigation, and irrigation is contained in a report just received at the Department of Commerce from commercial attaché W. C. Huntington, at Paris.

An outline of France's wealth in waterpower is given, with particular reference to the River Rhone as the most important source of potential hydroelectric power in France. The report also includes a history of the utilization of the Rhone and an explanation of a new law applying to the power development of this river. Estimates place the total cost of the proposed developments at 1,848,000,000 francs. The financing of this project will be accomplished by a gradual carrying out of the entire scheme, extending over a period of years.

Of particular interest to American manufacturers is the opportunity afforded for participation of American capital and for the sale of American-made machinery and supplies. Practical steps have already been taken toward the constitution of a great national Rhone development company, and there is little doubt that force of circumstances will compel the development, in one form or another, of this national resource.

Copies of the report and of the law authorizing the power development of the River Rhone, together with an outline of the progressive financing scheme for the project, may be obtained from the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce, or from the Bureau's district offices by referring to Exhibit No. 1178.

Cleveland Letter

Prospects for greater need of machinery and equipment in manufacturing establishments in the Cleveland, Ohio, district grow better as the year advances. One of the best indications is the greater use of electric power in the last few weeks. In Ohio only four cities show a decrease in power uses from the same period a year ago, these being Columbus, Lorain, Canton and Akron. In nine other large cities the average increase in power use is 12 per cent, Warren showing the largest gain, with 70 per cent, and Cleveland the least with about 2 per cent.

Definite improvement in orders is reported by such Cleveland firms as the Willard Storage Battery Co., Columbia Axle Co., Interstate Foundry Co., Ferro Machine and Foundry Co., National Acme Manufacturing Co., K-W Ignition Co., Grant-Lees Gear Co., Ohio Body and Blower Co.

Increase in employment in the various industries in the Cleveland district shows a gain of 7 per cent for January over December, or approximately 5,000 persons.

W. C. Sargent Dead

William C. Sargent, for twenty-two years secretary and a director of the Chain Belt Company, Milwaukee, Wis., died suddenly on Feb. 5. He was seventy-three years of age. Mr. Sargent was prominent in industrial circles of Milwaukee and St. Paul and had a wide national acquaintanceship. In 1871 he organized the De Cou, Corliss & Sargent Co., of St. Paul, manufacturers of sash and doors. In 1900 Mr. Sargent went to Milwaukee to become secretary, and later a director, of the Chain Belt Company. He was also a director of the Federal Malleable Company, West Allis, Wis.

The Super-Power System and New England

Professor L. P Breckinridge, of Yale University, addressed the members of the New Britain Branch, Connecticut Section, of the American Society of Mechanical Engineers on Tuesday evening, Jan. 31. His subject was the "Importance of the Super-Power System to New England." This system contemplates the establishment of a zone comprising practically all of New England, New Jersey, eastern Pennsylvania (including the coal mining regions), and a large part of New York State, in which would be built a series of power generating stations that would be linked together by high tension transmission lines in such manner that the energy from all or any number of the stations could be delivered to the system as to a great reservoir, and used wherever and whenever needed.

In this way all available water powers could be utilized to their full capacity all the time, instead of less than one-half the time, as at present. This would relieve the steam stations of a portion of their load. An immense saving would also result from the practicability of operating steam stations to peak load capacity when running, and to shut them down completely when their output was not needed because of power being available from other sources.

Though the water powers within the zone aggregate but an insignificant proportion of the power at present required (less than 20 per cent), by their continuous operation all of their energy could be utilized. This, in conjunction with the concentration of steam generated energy into large and efficient units, would bring about a saving within the zone of fifty million tons of coal annually, besides relieving the railroads of a large part of their coal burden.

Chicago Letter

After a month of very good business the machine tool dealers are rather disappointed with the present trend. The outlook, however, is still very optimistic in a general way. Inquiries as a whole continue to grow more plentiful and buying appears to be steadier.

The railroads are keeping pretty well in the background. The Santa Fe has made additional purchases and inquiries in the past week, one of these calling for a double-end punch and shear, capacity to punch a 4-in. hole in 2-in. plate and shear 12 x 2½-in. flats, 4½-in. rounds and split one ⅞-in. plate, depth of throat 18-in.; also a 36-in. lathe, 9 ft. between centers, to be used for piston work, both machines to be motor driven, 230 volt D. C. According to W. B. Storey, president of the Sante Fe System, the 1922 budget calls for an expenditure of about $45,000,000 which is about $10,000,000 higher than that of last year. The budget includes an expenditure of $724,281 for shop machines and tools, an outlay of $1,041,350 for shop buildings, and $1,101,868 for rails and other track material.

The Donahue Steel Products Co., 122 So. Michigan Ave., sold an order comprising several machines to the Seyler Manufacturing Co., of Pittsburgh. Many of the sales are for individual machines, viz.; Koehring Machinery Co., Milwaukee, one 72-in. gear cutter; the Brunswick-Balke-Collender Co., a 20-in. crank shaper.

From the crane market, which has been very inactive, comes a report that the Whiting Corporation, Harvey, Ill., received an order from the Aetna Portland Cement Co., Bay City, Mich., for three 100-ft. span cranes, equipped with three-yard buckets.

Curt A. Esser, architect, 38 South Dearborn St., is receiving bids on a three-story factory and boiler house, 80 x 214 ft., to be equipped with a high-pressure boiler, for the Gurinian Candy Co., of St. Joseph, Mich., to cost about $75,000.

W. Gibbons Uffendell, 39 South State St., is making plans for a two-story laundry and powerhouse, 94 x 168 ft., to be erected at 1822 to 1828 South Wabash Ave.

Valparaiso University, Valparaiso, Indiana, is contemplating the opening of a machine repair shop in the University and will evidently be in the market for a few machines. Further information may be had by communicating with Mr. Loob in the Auto School, care of the University.

Warner & Swasey Company Announces Price Cuts

The Warner & Swasey Co., Cleveland, Ohio, has made public the following comparative figures to show the extent of reductions from peak prices:

Machine	Peak	Present
No. 2A Universal Hollow Hex. Turret Lathe	$2,690.00	$1,695.00
No. 3A Universal Hollow Hex. Turret Lathe	3,900.00	2,450.00
No. 1 Plain Head Turret Lathe	590.00	370.00
No. 2 Plain Head Turret Lathe	815.00	510.00
No. 4 Geared Friction Head Turret Lathe	1,230.00	775.00
No. 6 Double Friction Back Geared Turret Lathe	1,755.00	1,100.00

In explanation of the reductions, the company states that it has carefully analyzed future labor and raw material costs and has brought its prices down on such a basis that there can be no further reductions in prices of the product. This company also says:

"It has been apparent that some of the reluctance in machinery buying is due to lack of confidence, on the part of the buyer, in machine tool prices today. Of course, many industrial companies are not in operation to a sufficient degree to buy machinery at any price, but on the other hand, there are many who should buy to replace inefficent equipment and reduce their production costs to a point where they can secure themselves against competition.

"After all, the buyer of equipment is not pursuing the wisest course unless he picks out the most efficient equipment upon a basis of cost of the piece produced and the reputation of the maker behind it. Putting money into equipment is an investment of the highest order and a manufacturer's profit in the competitive times ahead will depend to a considerable extent upon the efficiency of the equipment selected.

"We believe the first necessity for the machine tool maker is to increase the confidence of the buyer in his product, in his price and in his ability to stay in business. It probably would be well for many of the other machine tool companies to analyze their business and their future and then to tell the world when they have gotten down to bed rock prices. The automobile business at the present time is unsettled because the buyer does not know whether or not he can save money by buying now or waiting a while longer. The machine-tool world and the equipment users should settle among themselves this same question, and until that is done there cannot be a large increase in the buying of equipment, excepting on the part of those buyers who will purchase from the makers who are forced to liquidate at any cost."

Motor Transport in Bermuda

A majority in the Bermuda House of Assembly has been won over to the plan that will give the colony motor-transport service throughout the island, under government control and possibly under private ownership. The plan is to use the lighter style of motor buses, with a capacity of about twenty-four persons, and also freight trucks of about the same weight; no other type of vehicles may be used in this service. The leading horse-transport firm is selling out its entire outfit, which may be taken as an indication that the same firm will be in the running for the new method of transport, and that by the end of 1922 Bermuda will have a controlled motor service.—*Commerce Reports.*

Business Items

The Perdieu Tool Manufacturing Co., Milwaukee, Wis., has taken over the Meigs-Powell Co., also of that city. J. D. Powell, sales manager of the combination announces that a line of spring calipers, dividers, etc., will soon be ready for distribution. R. A. Perdieu is president of the concern; J. B. Matthews, secretary-treasurer; Max Kobs, superintendent of the plant.

The Oliver Machinery Co., of Grand Rapids, Mich., has established a branch office in the Lincoln Bank Bldg., Minneapolis, Minn. George C. Ramer has been appointed manager.

The Sundh Engineering and Machine Co., Philadelphia, Pa., manufacturer of brass and copper mill machinery, has closed its New York office and opened a new downtown branch in Philadelphia, at 16th and Sansom Streets.

The Triangle Machine Works has been incorporated at Cincinnati, Ohio. Capital stock, $25,000; directors, S. J. Gish, L. Cohen and George Baker, all of Central City, Ohio.

The Ful-Flo Specialties Co. has acquired the plant and equipment of the Ful-Flo Pump Co., of Blanchester, Ohio. The manufacture of Ful-Flo pumps, coolant and lubricating systems will continue under the new ownership. J. P. Clifton, formerly of the Clifton-Conner Corporation, Buffalo, N. Y., will be the general manager.

The Marion Machine, Foundry and Supply Company, of Marion, Ind., re-elected the same officers and board of directors, as follows: Mrs. C. P. Chamberlain, Washington, Pa., president; Cecil C. Chamberlain, Tulsa, Okla., vice-president; Henry L. Erlewine, of Marion, secretary-treasurer and general manager. Reports of the condition of business at the four plants of the company, which are located in Pennsylvania, Indiana and Oklahoma, were considered satisfactory.

The John Hugo Manufacturing Co., New Haven, Conn., recently filed a certificate with the Secretary of the State of Connecticut, increasing the capital stock of the company from $50,000 to $150,000.

The Merrow Machine Co., Hartford, Conn., machinery manufacturer, held its annual meeting on Feb. 8 and elected the following officers for the ensuing year: J. M. Merrow, president; P. G. Merrow, secretary-treasurer; G. W. Merrow, assistant treasurer. The directors chosen were the three mentioned officers and J. M. Washburn and W. H. Stedman.

The Eastern Manufacturing Co., Norwalk, Conn., has filed a certificate of incorporation under the laws of Connecticut, to manufacture timer protectors, internal combustion engines, tools and equipment for motor vehicles. The capital stock is $50,000. The president and general manager is Philip H. Fielding, 20 Pleasant St., East Norwalk; vice-president and secretary, Frank N. Glover; treasurer, Charles P. Fielding.

The Burke Machine Tool Co., Conneaut, Ohio, has announced a series of dealers' discounts on its products. The reduction amounts to 20 per cent on the entire line of tools and machines, excepting drills which are allowed 30 per cent. The company states that lowered production costs are responsible for this decrease in price.

The Levering-Matthews Co. has been incorporated at Dayton, Ohio, to build special machinery and tools. Incorporators are B. L. Levering, of Boston, W. G. Matthews, J. K. Matthews, J. H. Lukey and W. F. Miller, of Dayton.

The Surface Combustion Co., Inc., of 366 Gerard Ave., New York City, has secured exclusive license for exploiting the Andrews rust proofing process, a British invention. The process is said to form an ebony, rust-proofed finish on ferrous metals.

At the annual meeting of the stockholders of the Youngstown Foundry and Machine Company, Youngstown, Ohio, the following board of directors was re-elected: W. J. Wallis, B. G. Parker, Frank Williams, S. K. Hine, H. T. Parrock, A. E. Adams and Emanuel Hartzell. The board did not reorganize following the meeting. The business of the company the past year was about 35 per cent of capacity, officers reported.

The Youngstown Boiler and Tank Co., Youngstown, Ohio, has elected the following directors: J. P. Keene, R. I. Ingalls, R. D. Patterson, C. R. Vogel and W. H. Heywood. Officers chosen were: President, J. P. Keene; vice-president, R. I. Ingalls; secretary-treasurer, C. R. Vogel. Mr. Ingalls is a resident of Birmingham, Ala.

Fire recently caused considerable damage to the machinery of the McQuay-Norris Engineering Corporation at Connersville, Ind. Several large ovens were made practically useless and several thousand dollars worth of machinery was so crippled as to make it virtually worthless. The plant will be rebuilt as soon as possible.

Articles of dissolution were filed recently by the Winterhoff Tool and Machine Co., of Elkhart, Ind., giving notice of the dissolution of the partnership of Benjamin F. and Henry R. Winterhoff.

Kirkland Bros. Machine Co. has been formed with $250,000 capital to manufacture a machine newly patented for the grinding of cylindrical parts for automobiles and for small tools. The principal incorporators are Arthur Kirkland, of Detroit, and Thomas H. Kirkland of 31 Elm St., Springfield, Mass. It is stated that manufacture of the machine will begin in Detroit at once.

Personals

IWAO NISHI has been appointed by the Japanese government to be commercial attache to its Embassy at Washington. Mr. Nishi also maintains offices at 156 Broadway, New York City.

G. C. MORGAN has been appointed general sales manager of Earl Motors, Inc., Jackson, Mich.

ERNEST F. DU BRUL, general manager of the National Machine Tool Builders' Association, lectured before the Engineers' Club of Cincinnati on Thursday evening, Feb. 16. His subject was "Managing Production According to Business Cycles."

J. A. MCCLURE, president of the Bruun-McClure Company, Columbus, Ohio, distributor of power farming equipment, has sold his interest in that company and has joined the Martin Parry Corporation, York, Pa., automobile body builder, as sales manager of the dump body and accessories division.

WILLIAM W. CASWEL, has been elected secretary-treasurer of the Northway Motors Corporation, Boston, Mass. He takes the place of James F. Finneran, who resigned.

JAMES F. CAVANAUGH, president of the Northway Motors Corporation, Boston, Mass., manufacturer of the Northway trucks, etc., has resigned as president and will become chairman of the board of directors He was succeeded by Ralph E. Northway, former vice-president of the company.

ROY P. MILLS, manager of the cost and estimating department of the Lake Torpedo Boat Company, Bridgeport, Conn., was elected a director of that company at the annual meeting of the stockholders held recently. Mr. Mills succeeds the late Frank Miller, who was also treasurer of the concern.

ALBERT H. WHIPPLE, superintendent of the Whitin Machine Works, textile machinery manufacturer, Whitinsville, Mass., recently completed fifty years of service with the company and in honor of the event he was presented with a fifty-year service pin by E. Kent Swift, general manager of the plant. Mr. Whipple entered the employ of the company in January 1872, as an apprentice, and has worked his way up until he is now superintendent, a position he has held since 1897.

CHARLES A. IRWIN, who until recently was vice-president and general manager of the Canton Sheet Steel Co., Canton, Ohio, has gone to Milwaukee where he will take charge of the Milwaukee Rolling Mill Co. Mr. Irwin will be president and treasurer of the Milwaukee Rolling Mill Co.

J. IRWIN, who has been assistant auditor at the plant of the Canton Sheet Steel Co., Canton, Ohio, will go to Milwaukee where he will be associated with his father, Charles A. Irwin, who recently became president and trasurer of the Milwaukee Rolling Mill Co.

Obituary

RICHARD H. RICE, general manager of the Lynn, Mass. plant of the General Electric Co., died on Feb. 10. He was fifty-eight years old.

WILLIAM H. BARSTOW, president of the Union Tank Car Co., of New York, died on Feb. 10 at his home in West Orange, N. J. He was forty-five years old.

FRANK S. DINSMORE, for the last twenty-four years a member of the staff of *Railway Age*, died in New York on Feb. 15. He was sixty-three years old.

Forthcoming Meetings

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24, Engineering Societies Building, New York City. B. Staughton, secretary.

American Society for Steel Treating: Sectional meeting, New York City, Mar. 3, Hotel McAlpin, 34th St. & Broadway. W. H. Eiseman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Shears, Rotary, Turret, Gray

Southwark Foundry and Machine Co., Philadelphia, Pa.

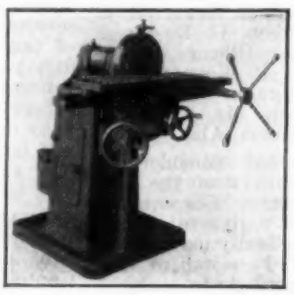
"American Machinist," Sept. 29, 1921.

The No. O machine is intended for cutting steel of 16-gage or less, and can be mounted on either a bench or a pedestal and controlled by a foot lever. The No. 1 machine is for cutting metal up to 14-gage. The No. 2 machine is for metal up to 8-gage. The illustration shows the No. 3 machine, which differs from the others primarily in the fact that it employs two turrets. It is intended for cutting metal up to ⅜ in. in thickness, employing a cutting speed of 10 ft. per minute. The diameter of the cutters is 4 in., the throat depth 36 in., and 3 hp. is required. Any shape or opening can be cut, with the minimum radius at the corners equal to the radius of the cutters.

Grinding Machine, Ring-Wheel, Knee-Type, No. 41

Graham Manufacturing Co., 71 Willard Ave., Providence, R. I.

"American Machinist," Sept. 29, 1921.



The head of the machine is a separate part, secured on the top of the column. The spindle is mounted in Timken roller bearings, carried in large removable bushings. The rear bushing is held in position by a strong helical spring, so that it automatically takes up end motion and wear. Larger adjustments are made by means of a castellated nut. The abrasive ring holder is made of pressed steel. The abrasive ring may be set out as wear occurs. The rings used are 12 in. in outside diameter and either 7 or 8 in. on the inside diameter. The machine has a capacity for grinding surfaces 6 x 12 in. in size. It weights about 2,000 pounds.

Grinder, Motor, A. C.

J. G. Blount Co., Everett, Mass.

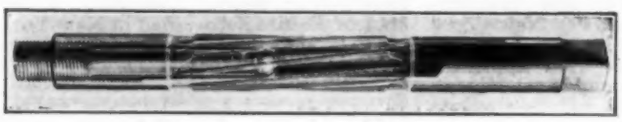
"American Machinist," Sept. 29, 1921.

The machine is equipped with SKF ball bearings in dust-proof mountings. The spindles are of high-carbon steel ground to size. Each rest is made in one piece and adjustable. The tool tray and water pot are separate and detachable. The equipment includes two grinding wheels, one coarse and one fine, unless otherwise specified. Motors are of the Westinghouse design, and the starting switch of the textile snap type. The machines are built in the following sizes: ½ hp., 8 x 1-in. wheels; 1 hp. 10 x 1½-in. wheels; and the 2 hp., 12 x 1½-in. wheels.

Reamer, Expansion, Spiral

E. J. Kruce & Co., 322 Harper Ave., Detroit, Mich.

"American Machinist," Sept. 29, 1921.

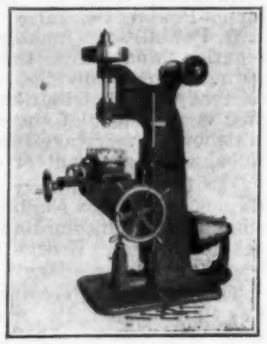


The tool is intended especially for reaming piston-pin holes. It is said that the adjusting device offers a large range for expansion and gives ease in operation; also that the expansion is concentric, and is not affected by an accumulation of dirt in the slots. Because of the fact that the blades are helical, key-seated or oil-grooved parts can be reamed without chatter. The adjusting screw at the front end is turned by means of a screwdriver, so as to drive forward the expanding roll, which revolves freely on the end of the screw.

Die-Sinking Machines, P. & W., Improvements in

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," Sept. 29, 1921.

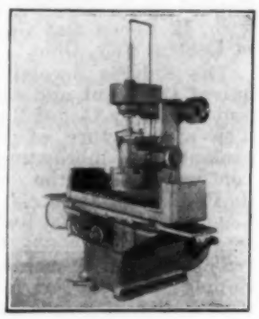


The driving spindle has been provided with a positive pin lock for four positions, so that the chuck or collet can be tightened without holding the driving belt. The spindle pulley has a system of oil grooving opposite to the direction of rotation, so that oil is continually carried upward. A floating babbitt washer takes the thrust of the cut on the spindle. The main drive cone has a hollow spindle with communicating oil holes delivering the oil to a series of felt-packed grooves. To protect the ways from chips and dirt, leather wipers are attached to the knee. The vise capacity has been increased. A telescopic elevating screw is furnished. The outboard bearings for the knee and vise slides have been strengthened.

Grinding Machine, Surface, Vertical, 14-In., Improvements in

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," Sept. 29, 1921.



The ball-bearing mounting of the spindle has been redesigned, the weight of the wheel unit being carried on springs set against the upper bearing, providing an automatic take-up. The table drive has been strengthened by the introduction of hardened shafts, gears and clutches, lubricated from sight-feed oilers on the front of the case. Split bearings are used. The idlers over which the main drive belt runs have been equipped with roller bearings. Among other changes, the motor base has been made adjustable. The drive for the rotary tilting chuck is equipped with a flexible coupling.

Level, Machine Aligning, Precision

Universal Boring Machine Co., Hudson, Mass.

"American Machinist," Sept. 29, 1921.

While this level is a general purpose instrument, it is particularly adapted to the leveling of machine tools. The metal frame is 27 in. long, and the base has an accurately scraped bearing. The handle is molded of a heat insulating material. The vial is made of Jena glass, is guaranteed to be accurate to 5 sec. of arc per graduation, and is mounted so that it can be adjusted both in vertical and horizontal planes. A felt-lined mahogany case protects the instrument when not in use.

Boring Machine, (Re), Cylinder, Combination Ford and Fordson, No. 2

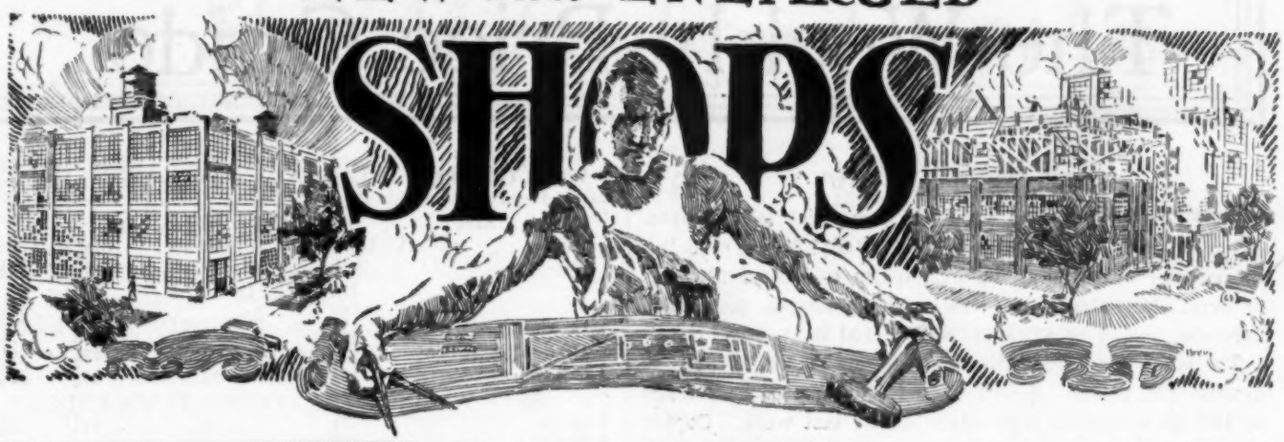
Foote-Burte Co., Cleveland, Ohio.

"American Machinist," Oct. 6, 1921

The No. 2 Ford cylinder reboring machine has been adapted to the handling of the cylinders of Fordson tractors. The machine is of the single-spindle type and intended for heavy duty. Quick acting clamps are provided to hold the cylinder block in place. The driving mechanism is enclosed in an oil bath in the head. To provide the feed for the cut, the entire head slides on the column, having a vertical travel of 16 in. The cutter is of the adjustable-size, ten-blade type. The burnishing tool has rollers so mounted that their positions are adjustable.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ala., Albertville—W. T. Hanes—machinery for proposed plant for the manufacture of broom handles, etc.

Cal., Los Angeles—F. Weinberg, North Gates St.—machinery suitable for the manufacture of bird cages, aquariums, flower pot stands, etc., including one 30 in. squaring shear; one pan brake; one square pan forming machine; one brace and wire bender; one wire straightening machine for No. 16 wire; one electric spot welder for wire works; one enamel paint baking outfit and one pipe bender for conduit pipe and brass tubing.

D. C., Wash.—The Byzantine Mfg. Co., 1303 9th St., N. W., S. C. Height, Pres.—bottling machinery, labeling machinery, vats, etc., for the manufacture of toilet articles, etc.

Ga., Baxley—J. M. Kinard—machinery for the manufacture of corn brooms.

Ga., Decatur—W. S. Ansley—machinery and equipment for canning and dehydrating plant.

Ia., Keokuk—Kollmyer & Talbot—twist drills from ¼ in. to 2 in. x ½ in., (used).

Ill., Chicago—The Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., A. Walker, Purch. Agt.—one 36 in. lathe, 9 ft. between centers to be used for piston work, motor driven 230 volt D.C., taper attached to be filled with four jawed independent steel chucks, double end punch and shear, capacity to punch 4 in. hole in 2 in. plate and shear 12 in. x 2½ in. flat bars, 4½ in. round bars and split 1⅞ in. plate, depth of throat 18 in.

Ill., Chicago—Leitelt Bros., 7731 South Chicago Ave.—one 72 in. double crank press suitable for 20 gauge sheet metal, (used preferred).

Ill., Chicago—M. Leonard, 1335 West Washington St.—one double column press equivalent in power to a No. 7 Walch geared press.

Ill., Chicago—J. Loss, 1228 Winamac Ave.—one lathe and one drill press.

Ill., Chicago—The Midwest Die & Stamp Co., 1135 Belmont Ave.—one 1 in. screw machine, single pulley drive.

Ill., Chicago—The Monarch Tool & Machine Co., 522 South Clinton St.—one 3,000-lb. punch press.

Ill., Chicago—The Union Special Machine Co., 400 North Franklin St.—one 60 in. power square shear.

Ill., Chicago—The Vaughn Novelty Mfg. Co., 3209 Carroll Ave.—one routing machine; one punch press, size about American No. 4½ with 2½ in. stroke.

Ill., Galesburg—The Rowe Mfg. Co., Holton and West 3rd Sts.—one 50-100 ton geared punch press.

Ill., Mendota—H. D. Conkey & Co., G. S. Schuller, Eng. Dept.—acetylene cutting equipment complete; electric rivet heating equipment; gas rivet heaters and large punch press.

Ill., Sterling—E. L. Reed Mfg. Co.—motor driven woodworking machinery.

Ind., Angola—The Lampman Tool Co., H. W. Lampman, Mgr.—automatic wire and metal forming machine, capacity equivalent to Baird Four Slide, No. 4; one automatic drilling machine, capacity ⅛ in. drills; one roller feed for punch press for 8 in. stock; barrel plating outfit; tilting tumbling barrel; roll grinder, capacity ⅜ in. pins; eye forming machine, capacity ⅛ in., profiling machine.

La., Lake Charles—M. Scimemi, P. O. Box 183-1—complete machinery, equipment and supplies for bottling plant.

Mass., Orange—The Rodney Hunt Machine Co., H. M. Johnson, Purch. Agt.—chain falls of Edwin Harrington type, sizes 4,000 lbs.; 1,500 lbs.; 1,000 lbs.

Mich., Detroit—The Mack Ave. Auto & Eng. Co., 13230 Mack Ave.—miscellaneous repair equipment for service station and garage.

Mich., Detroit—The Mission Bead Co., 2421 Smith Ave.—one 10 x 15 Gordon press.

Minn., Minneapolis—The Merviss Mfg. Co., 116 Washington Ave., N.—power stitching machines for use at Amery, Wis.

Minn., Minneapolis—L. D. Sisson Co., 712 Builders Exchange Bldg., L. D. Sisson, Purch. Agt.—one large structural punch, one air compressor and one motor.

Minn., Minneapolis—The Studebaker Auto Livery Co., 1023 Marquette Ave., C. George, Vice Pres.—one drill press, 18 in. table, and one Weaver hydraulic press.

Mo., Hannibal—The Robinson Bros. Paint Co., 201 South 5th St.—machinery for proposed paint factory.

Mo., Joplin—The Empire Engineering Service Co., 301 Miners Bank Bldg., R. Camblin, Purch. Agt.—electric power lathe, and a power drill press.

Mo., Kansas City—W. W. Brown, 1831 Grand Ave.—lathe, 18-20 in. and 8-10 ft. breath.

Miss., Vicksburg—The Henegan Mfg. Co., H. J. Henegan, Purch. Agt.—one 36 in sander, double headed sticker, light swinging cut off saw and other woodworking machinery.

N. Y., Adams—The Greenley Machine Co., D. R. Greenley, Purch. Agt.—milling machine and shaper.

N. Y., Oxford—W. W. Butts—cylinder portable reboring machine, one that will work on open or closed end automobile cylinders, (used).

N. J., East Orange—The Simms Magneto Co., North Arlington Ave., C. Jacobson, Purch. Agt.—one No. 11 Hanson & Van Winkle polishing lathe.

N. J., Merchantville—The Norton Mfg. Co.—equipment for sheet metal work including punches, presses, brakes, etc.

N. Y., Buffalo—J. Ingel, 630 Jefferson Ave.—small printing press.

N. Y., Buffalo—C. F. Schubert & Son, 210 Burgard Pl., C. F. Schubert, Purch. Agt.—one 14 in. lathe.

N. Y., Buffalo—The D. H. Stoll Co., 31 Lansing St.—Hardness testing machine, 6 in. to 7 in. diameter.

N. Y., Buffalo—Whistler & Schanland, 1283 Niagara St.—six small power or foot punching presses.

N. Y., Cobleskill—The Harder Mfg. Co.—thread cutting machine, capacity ½ in. to 1 in. for cutting threads on silo rods.

N. Y., Depew—The Gould Coupler Co., W. H. Pattenden, Purch. Agt.—three presses for straightening castings.

N. Y., Lowville—The Atlas Vise Co., Inc.—general machine shop tools and fixtures including special machinery for vise manufacture.

N. Y., New York—The American Gas Improvement Co., 2 Rector St.—machinery for gas plant at Winchester, Va.

N. Y., New York—The New York Central R.R., Grand Central Terminal—one 36 in. American Tool Wks. medium pattern metal planer.

N. Y., New York—The Worthington Pump & Mchy. Corp., 115 Bway.—one horizontal floor boring, drilling and milling machine, similar to Niles-Bement-Pond Machine, symbol H. M. 8.

N. Y., Potsdam—The Van Ness Sanford Co., Inc., H. J. Sanford, Purch. Agt.—general machine shop machinery also equipment and special machinery for motor repair.

N. Y., Sacket Harbor—The Weaver Machine Co., W. H. Weaver, Purch. Agt.—power drill press.

N. Y., Syracuse—The United Fertilizer & Lime Co., Merchants Bank Bldg.—rock drilling, handling, screening and crushing machinery for Gouverneur plant.

N. Y., Watertown—The Greene Machine Co., C. H. Greene, Purch. Agt.—special machinery for the repair and manufacture of paper mill machinery.

N. C., Crabtree—C. Von Cannon—saw mill machinery.

N. C., Lexington—G. W. Smith, East Center St.—band saw, jointer, cut off saw, rip saw and sander, (new or used).

N. C., Murfeesboro—M. E. Worrell—brick making machinery, (new or used).

N. C., Rose Hill—The Atlantic Coffin & Casket Co., E. M. Carr, Puch. Agt.—belt driven woodworking machinery consisting of the following: one ½ in. double spindle shaper, 36 in. band saw, 12 in. moulder, saw table, tilting arbor, sander, jig saw, knife grinder, swing cut-off saw, rip saw, 30 to 36 in. wide cabinet planer, several lumber trucks for use on floor of plant (new or used).

N. C., Wilson—Hackney Bros., T. J. Hackney, Pres.—machinery and equipment for the manufacture of buggies.

O., Cincinnati—The Chamber of Commerce, G. W. Breil, Mgr. Dept. of Civic Affairs—5 ton crane with radius of 95 ft.

O., Cincinnati—The Eastern Mchy. Co., 408 East Pearl St., A. Smith, Purch. Agt.—one 12 in., 14 in. or 16 in. lathe with 8-10-12 ft. bed, also small Universal miller No. 2.

O., Columbus—The Osborne & Saxton Mchy. Co., 4th and Russell Sts.—one 100 lb. upright Bradley hammer and one 200 ton wheel press (used).

Ore., Portland—The Consolidated Railway Equipment Co., foot of Knott St.—W. C. Schmitt, Purch. Agt.—one 35 to 40 ton electric overhead traveling crane with a span of 49 ft. and wired for 220 volt, A.C.

Pa., Clearfield—The Clearfield Machine Shops, 4th St.—one No. 3-A Mitts & Merrill Little Giant keyseater, 25 in. stroke, 2 in. wide.

Pa., Cynwyd—The Ayers Mfg. Co., Inc., (yarns) M. J. Ayers, Purch. Agt.—looms, twisters, etc., for new factory.

Pa., Phila.—The Austin Co., Bulletin Bldg.—gasoline and oil tank, air compressor, and general auto repair machinery, for garage owned by J. H. Paul, Carbondale.

The Weekly Price Guide

THIS WEEK'S MARKET

THE Pittsburgh mill price on structural steel shapes, plates and bars continues at $1.40@$1.50 per 100 lb.; the smaller figure applying principally to lots of 100 tons or over. Mill shipments, New York, of shapes, plates and bars are quoted at $1.78@$1.88 per 100 lb.

Tin is quoted in the New York warehouses at 31c. as against 32c. per lb. Solder (½ and ½) is quoted in Chicago at 19c. as compared with 19¼c. per lb. last week. Copper and zinc markets show slightly better tone; lead firm. Reductions ranging from ¼c. to ½c. per lb. are quoted on old metals (non-ferrous) in both Cleveland and Chicago.

Linseed oil is quoted in New York at 87c. as against 83c.; in Cleveland at 85c. advanced from 80c. and in Chicago at 89c. as against 84c. per gal (5 bbl. lots) one week ago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.50
Northern Basic	21.02
Southern Ohio No. 2	22.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.26
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21.76
Virginia No. 2	27.74
Basic	19.84
Grey Forge	21.50
CHICAGO	
No. 2 Foundry local	19.70
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.96
Basic	19.96
Bessemer	21.46

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	4.00	3.75	4.15
Nos. 12 and 14.	3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.40	4.40	4.15	4.55
Nos. 22 and 24.	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	71	58½	⅜ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.45	3.25	3.40
Cold finished flats, squares	3.95	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.53
Soft steel bar shapes (base)	2.53	2.36	2.53
Soft steel bands (base)	3.13	....	3.13
Tank plates (base)	2.63	2.46	2.63
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛	8.50		12@13
5/32	7.15		11@12
3/16 to ¼	6.75		10@11

High speed steel is quoted in Cleveland at 90c. per lb.

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			14.00
Tin, 5-ton lots, New York			31.00
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 4.77½; New York			5.12½
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	21.50@22	23.00
Copper wire (carlots)	15@15.25	17.00	16.25
Copper rods (ton lots)	19.75	22.00	19.50
Copper tubing (100-lb. lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	23.50	19.00
Babbitt metal (best grade)	32.00	41.00	36.00
Babbitt metal (commercial)	16.50	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.00	10.50	10.50
Copper, heavy, and wire	10.75	10.00	9.50
Copper, light, and bottoms	8.75	8.50	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.50
Brass, light	4.25	4.00	5.00
No. 1 yellow brass turnings	5.50	5.00	5.25
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.13
Cotton waste, mixed, per lb	.055@.09	.09	.11
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	2.50	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.87	.85	.89
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		$3.00
Coke, prompt foundry, Connellsville	per net ton		3.75@4.25

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-5%	60-10%	60-10-10%
1¼ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Square and hex., head cap screws	75—10%	....	.....
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75-10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.50	$3.25	$3.43
Cone heads, ditto (net)	3.60	3.35	3.53
1¼ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60-5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.55
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	50-10%	50-10%	.....
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.04	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

Pa., Phila.—The City Bureau of Highways, City Hall, Room 216, F. H. Caven, Dir.—one saw table, 20 in. swing; one 24 in. panel planer; one 36 in. band saw machine; one tenoning machine; one 16 in. jointer; one swing saw machine, 14 in. saw; one single spindle shaper; one hollow chisel mortiser; one 14-24 x 7½ ft. sliding gap engine lathe; one 9 in. x 5 ft. engine lathe; one drill press; one 16 in. shaper; one 6 in. x 6 in. power hack saw and one 6,500 portable floor crane.

Pa., Phila.—A. Eichhorn & Sons, Palethrop and Turner Sts.—box manufacturing equipment also cut off saws and planers.

Pa., Phila.—W. C. Hays, 207 South 60th St.—a number of 40 in. carpet looms.

Pa., Phila.—C. Huth, 12th and Spruce Sts.—small floor lathe for screw cutting.

Pa., Phila.—The Kennedy Creamery Co., 28 South Water St.—large size power driven rotary screen for sifting milk powder and one oat crusher.

Pa., Phila.—The Penn Poster Co., 1320 Vine St.—one cylinder press for large circular work (used).

Pa., Phila.—The Phila. Furniture Co., 420 Green St.—additional woodworking machinery for new addition to factory.

Pa., Phila.—The Pilgrim Laundry Co., Broad St. and Glenwood Ave.—one medium size lathe and one drill press.

Pa., Phila.—A. Planschinat, 1824 Columbia Ave.—additional dryers, rollers, steam kettles, etc.

Pa., Phila.—The Quaker City Iron Wks., Richmond and Tioga Sts.—one 18 to 20 ft. lathe.

Pa., Phila.—The Superior Knitting Co., Inc., 2804 North 28th St., H. Fischer, Purch. Agt.—knitting machines for new factory.

Pa., Phila.—The Swartz Mfg. Co., 234 Cherry St.—one Fox Universal lathe (used preferred).

Pa., Pittsburgh—The Amer. Bridge Co., Frick Bldg.—one coping machine for Pincoyd Works.

Pa., Pottstown—W. F. Focht, 157 Hugh St.—one 2 ton ice manufacturing machine.

R. I., Providence—The Apco Mfg. Co., 1200 Eddy St.—one Brown & Sharpe No. 1 Universal milling machine with index centers, (used).

S. C., Greeleyville—The Mallard Lumber Co., T. W. Boyle, 1st Vice Pres.—one trimmer.

Va., Denbeigh—J. W. Hoopes, P. O. Box 45—small tablet machine to make tablets for drug trade up to ½ in. (new or used).

Va., North Emporia—J. D. Woodward—machinery for the manufacture of barrel staves for truck barrels.

Va., Pulaski—The Superior Anthracite Coal Corp., C. E. Smith, Pres.—one 80 hp. steam hoist and other mining equipment, (new or used).

Va., Richmond—The Pear Laundry, 12th and Main Sts., J. R. McCauley, Purch. Agt.—complete line of modern machinery to replace that which was destroyed by fire.

Va., Richmond—C. Saunders Printing Co., 12th and Main Sts., C. Saunders, Purch. Agt.—complete line of machinery to replace that which was destroyed by fire.

Va., Stuart—J. D. Blackard Stave & Cooperage Co., J. D. Blackard, Purch. Agt.—machinery for cutting splints for chair bottoms.

Wash., South Tacoma (Tacoma P. O.)—The Northern Pacific Ry., 522 2nd Ave., S., St. Paul, Minn., plans to improve its shops here. Estimated cost, $350,000. H. E. Stevens, St. Paul, Ch. Engr.

W. Va., Belle—The Belle Alkali Co.—equipment for the manufacture of caustic soda and chlorine.

W. Va., Wheeling—The Wheeling Steel Corp., Wheeling Steel Corp. Bldg.—about 20 tools for new rod and wire mills at Portsmouth, O., also several tools for plant at Steubenville, O.

Wis., Chippewa Falls—D. Kunsman, 29 West Spring St.—equipment for auto repair work.

Wis., Darlington—E. H. Rodham—equipment for auto repair work.

Wis., Greenville—E. Schroeder—lathe and small tools for auto repair work.

Wis., Menasha—The Menasha Tractor & Mchy. Co., 6th St., J. M. Robinson, Purch. Agt.—foundry equipment and probably a crane.

Wis., Milwaukee—D. D. Green, 675 29th St.—one 8 ft. squaring shear, Niagara preferred.

Wis., Milwaukee—I. Hurwitz, 533 Milwaukee St.—one automatic knitting machine.

Wis., Milwaukee—The Rautbord Mfg. Co., 86 3rd St., Z. Rautbord, Purch. Agt.—one 18 in. lathe, and punch press.

Wis., Sparta—E. J. Sheldon—auto repair shop equipment and press.

Wis., Tomah—The Tomah Iron Wks. & Garage, R. S. Murray, Purch. Agt.—machinery for repair shop.

Wis., Waukesha—The Amer. Chest Co., c/o J. L. Martin, 612 McCall St.—woodworking machinery for the manufacture of tool chests.

Wis., St. Cloud—Abhold & Wagner—medium size drill press.

Wis., Wilton—The Wilton Canning Co., Main St.—canning and power machinery for proposed canning factory.

Ont., Glanworth—The Glanworth Milk Producers Assn., D. MacLachlan, Secy.—modern machinery and equipment for the manufacture of cheese. Estimated cost, $25,000.

Ont., Guelp—The Canada Ingot Iron Co., C. V. Davison, Purch. Agt.—forming roll to handle sheets 120 in. long by 18 in. gauge.

Ont., Windsor — Goyeau Bros., London St.—garage and auto repair shop equipment to replace that which was destroyed by fire. Estimated cost, $75,000.

Germany, Nuremberg—A. F. Mortel, Postcheck-Konto 1551 Postcheckamt—Correspond with firms who can supply machinery for the manufacture of conical chalk crayons.

Metal Working Shops

Cal., Napa—The Napa Union High School Dist. plans to construct a high school including a main building, manual training and domestic science buildings. Estimated cost, $300,000. W. H. Weeks, 369 Pine St., San Francisco, Archt.

Conn., Wallingford—The Wallingford Steel Co., 60 Academy St., plans to build a 1 story, 100 x 130 ft., 1 story, 25 x 100 ft. and 1 story, 40 x 100 ft. factory for the manufacture of metallic goods. Private plans.

Ill., Champaign—The Get-Gas Service Stations, Inc., will receive bids until March 1 for the construction of a 1 story, 40 x 80 ft. and 21 x 21 ft. warehouse and service station. Estimated cost, $40,000. H. F. Downing, Mgr. Private plans.

Ill., Chicago—C. R. Berglund, 2630 Wentworth Ave., manufacturer of auto bodies, is receiving bids for the construction of a 1 story, 100 x 125 ft. factory on 67th St. and Park Ave. Estimated cost, $75,000. A. G. Lund, 449 West 63rd St., Archt.

Ill., Elgin—The Elgin Stove & Oven Co., 14 Chicago, St., plans to build a 2 story factory. Estimated cost, $50,000. F. W. Dieterich, Genl. Mgr. Architect not selected.

Md., Ilchester—The Mineral Potash Co., 712 Equitable Bldg., Baltimore, plans to build a 1 story, 50 x 150 ft. factory, here. Estimated cost, $50,000. L. A. Hazard, Pres.

Mich., St. Joseph—Davidson & Weiss, Archts., 53 West Jackson Blvd., Chicago, are receiving bids for the construction of a 1 story addition to the factory of the Auto Specialty Mfg. Co. Estimated cost, $100,000. Noted Jan. 6.

Mo., St. Louis—C. Ulman, 4540 Lindell Ave., will build a 1 story garage at 221 York Ave. Estimated cost, $40,000. Noted Dec. 20.

N. J., Fernwood—(Trenton P. O.)—The State Hy. Dept., Trenton, has awarded the contract for the construction of an auto service station, here. Estimated cost, $94,300. Noted Jan. 6.

N. Y., Amboy—(Warner P. O.)—The Syracuse Pottery Co., 711 East Division St., Syracuse, plans to build a 1 story, 25 x 400 ft. pottery, here. Estimated cost, $25,000. J. L. Diesinger, Genl. Mgr.

N. Y., Lowville—The Atlas Vise Co., Inc., plans to build a 2 story factory. Address E. W. Fulton, Pres. Estimated cost, between $25,000 and $30,000.

N. Y., Watertown—The Greene Machine Co. of Watertown plans to build a 2 story machine shop. Address C. H. Greene. Estimated cost between $20,000 and $25,000.

O., Columbus—The Expression Piano Player Co., 1278 West Broad St., is having plans prepared for the construction of a 2 story, 48 x 100 ft. piano player factory on West Broad St. Estimated cost, $40,000.

Pa., Butler—The Hunting-Davis Co., Archts., Century Bldg., Pittsburgh, will receive bids until March 1 for the construction of a 3 story, 83 x 110 ft. garage and sales station on Main St., for the Butler Buick Co., Main St. Noted Feb. 16.

Pa., Phila.—Curtis-Grindrod Co., Engrs., 10 South 18th St., will receive bids until March 1, for the construction of a 1 story, 30 x 164 ft. garage at 877 North 45th St., for T. Aiken, c/o engineers. Estimated cost, $50,000.

Va., Norfolk—The Robertson Chemical Corp., Board of Trade Bldg., plans to rebuild burned building, or remodel and reconstruct the entire plant, at Money Point. Cost, to exceed $40,000.

Va., Richmond—Nolde Bros., Inc., 306 North 26th St., have awarded the contract for the construction of a 2 story, 59 x 91 ft. addition to their bakery at 2510 East Broad St. Estimated cost, $60,000.

W. Va., Charleston—The Mountain State Motor Car Co., 12 McFarland St., is having preliminary plans prepared for the construction of a 2 story, 80 x 220 ft. repair shop and garage. Estimated cost, $100,000. Private plans.

Wis., Chippewa Falls—D. Kunsman, 29 West Spring St., has purchased a site and plans to build a 1 story, 66 x 125 ft. garage. Estimated cost, $45,000. Architect not selected.

Wis., Darlington—E. H. Rodham is having plans prepared for the construction of a 1 story, 90 x 90 ft. garage. Estimated cost, $45,000. Private plans.

Wis., Sparta—E. J. Sheldon is having plans prepared for the construction of a 2 story, 50 x 88 ft. garage on Main St. Estimated cost, $50,000. Private plans.

Wis., St. Cloud—Abhold & Wagner have awarded the contract for the construction of a 1 story, 45 x 85 ft. garage. Estimated cost, $40,000.

Wis., Stevens Point—R. Newby Auto Co., 119 Strongs Ave., is having preliminary plans prepared for the construction of a 2 story, 80 x 135 ft. garage. Estimated cost, $40,000. S. Spalenka, Stevens Point, Archt. Noted Jan. 26.

General Manufacturing

Ill., Chicago—Ronneberg, Pierce & Hauber, Archts., 10 South La Salle St., are receiving bids for the construction of a 1 story, 60 x 152 ft. addition to laundry at 2901-11 Montrose Ave., for the Chicago Wet Wash Laundry. Estimated cost, $15,000.

Mass., Forge Village—The Abbott Worsted Co. has awarded the contract for the construction of a 3 story, 88 x 243 ft. combing plant. Estimated cost, $200,000.

Mich., St. Joseph—C. A. Esser, Archt., 38 South Dearborn St., Chicago, is receiving bids for the construction of a 3 story, 80 x 214 ft. candy factory for the Gurinian Candy Co., c/o architect. Estimated cost, $75,000.

N. J., Camden—Ballinger Co., Archts. and Engrs., 12th and Chestnut Sts., Phila., Pa., will receive bids until March 20 for the construction of a 7 story furniture factory and warehouse on Federal St., for the J. V. Van Scriver Co., c/o D. Jostro, Front and Federal Sts. Estimated cost, $500,000.

N. C., Durham—The city is receiving bids for the installation of a refrigerating plant at the city market. Estimated cost, $15,000. R. W. Rigsby, City Mgr.

O., Cleveland—The Representative Constr. Co., Hanna Bldg., is building a 1 story, 74 x 93 ft. millwork factory at 8120 Brunes Ave. Estimated cost, $40,000.

Pa., Phila.—The Supplee-Wills-Jones Co., 3339 Ludlow St., has awarded the contract for the construction of a 2 story, 55 x 100 ft. ice cream factory. Estimated cost, $20,000.

Wis., Milwaukee—The Amer. Granite Wks., 15th and Cleveland Aves., is receiving bids for the construction of a 1 story, 62 x 354 ft. granite works on 15th Ave. Private plans. Noted Feb. 2.

Wis., Wilton—The Wilton Canning Co., Main St., is having plans prepared for the construction of a 2 story, 60 x 85 ft. canning factory on Main St. Estimated cost, $75,000. Industrial Eng. Co., Laycock Bldg., Eau Claire, Archts.